# THE REVIEW OF APPLIED ENTOMOLOGY

## SERIES A: AGRICULTURAL.

VOL. I.

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# REVIEW OF APPLIED ENTOMOLOGY.

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# IMPERIAL BUREAU OF ENTOMOLOGY.

## Honorary Committee of Management.



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# ERRATA.

| | | | | |
|---|---|---|---|---|
| Page | 10 | line 36 | for "Flytaud" | read Feytaud. |
| ,, | 15 | ,, 20 | ,, "W. H. Fiske" | ,, W. F. Fiske. |
| ,, | 37 | ,, 26 | ,, "*Trogodesma*" | ,, *Trogoderma*. |
| ,, | 39 | ,, 12 from foot | for "*Aphidium*" | ,, *Aphidius*. |
| ,, | 48 | ,, 26 | for "*lineotella*" | ,, *lineatella*. |
| ,, | 49 | ,, 21 | ,, "*hyalipennis*" | ,, *hyalinipennis*. |
| ,, | 54 | ,, 47 | ,, "*Periodroma*" | ,, *Peridroma*. |
| ,, | 65 | ,, 1 | ,, "Jones (E. R.)" | ,, Jones (C. R.). |
| ,, | 71 | ,, 30 | ,, "*Copthora*" | ,, *Oophthora*. |
| ,, | 80 | ,, 2 | ,, "*Chorizagrotes*" | ,, *Chorizagrotis*. |
| ,, | 89 | ,, 3 from foot | for "*Trogosia*" | ,, *Trogosita*. |
| ,, | 119 | ,, 32 | for "*Lophynus*" | ,, *Lophyrus*. |
| ,, | 129 | ,, 19 | ,, "*Eucalymmatus*" | ,, *Eucalymnatus*. |
| ,, | 135 | ,, 50 | ,, "*subscrinita*" | ,, *subcrinita*. |
| ,, | 136 | ,, 7 | ,, "*Cacoesia*" | ,, *Cacoecia*. |
| ,, | 138 | ,, 28 | ,, "*bidentulus*" | ,, *bidentatus*. |
| ,, | 140 | ,, 3 | ,, "Bashoop" | ,, Boskoop. |
| ,, | 144 | ,, 14 | ,, "*Arthroenodax*" | ,, *Arthrocnodax*. |
| ,, | 146 | ,, 18 | ,, "*Chaulioides*" | ,, *Chalioides*. |
| ,, | 148 | ,, 17 | ,, "Burgess (Q.F.)" | ,, Burgess (A.F.). |
| ,, | 150 | ,, 19 | ,, "Semerang" | ,, Samarang. |
| ,, | ,, | ,, 24 | ,, ,, | ,, ,, |
| ,, | ,, | ,, 26 | ,, ,, | ,, ,, |
| ,, | 153 | ,, 10 | ,, "Parrott (P. T.)" | ,, Parrott (P. J.). |
| ,, | 154 | ,, 44 | ,, "*Sphodoptera*" | ,, *Spodoptera*. |
| ,, | 167 | ,, 1 | ,, "*Cocobacillus*" | ,, *Coccobacillus*. |
| ,, | ,, | ,, 5 | ,, ,, | ,, ,, |
| ,, | ,, | ,, 15 | ,, "*Cocobacilli*" | ,, *Coccobacilli*. |
| ,, | 169 | last line | for "*bipunctiferus*" | ,, *bipunctifer*. |
| ,, | 185 | line 29 | for "*Taxgionia*" | ,, *Targionia*. |
| ,, | 186 | ,, 11 | ,, "*pollini*" | ,, *pollinis*. |
| ,, | 209 | ,, 22 | ,, "Baranow" | ,, Baranov. |
| ,, | ,, | ,, 39 | ,, ,, | ,, ,, |
| ,, | 210 | ,, 1 | ,, "Leftejew" | ,, Leftejev. |
| ,, | 211 | ,, 34 | ,, "*Laphanus*" | ,, *Raphanus*. |
| ,, | ,, | ,, 35 | ,, "*Evysimum* | ,, *Erysimum*. |
| ,, | 219 | ,, 1 | ,, "cantaloupes" | ,, cantaloups. |
| ,, | ,, | ,, 19 | ,, ,, | ,, ,, |
| ,, | 222 | ,, 5 (1st Col.) | for "*Olearia hastii*" | read *Olearia haastii* |
| ,, | ,, | ,, 13 (2nd Col.) | ,, "*G. triacanthos*" | ,, *G. tricanthus*. |
| ,, | 226 | ,, 17 | for "*montanus*" | read *montana*. |
| ,, | ,, | ,, 20 | ,, "Canon city" | ,, Cañon city. |
| ,, | 227 | ,, 51 | ,, "Orleans" | ,, Orléans. |
| ,, | 229 | ,, 34 | ,, "Chapelle" | ,, Chappelle. |
| ,, | ,, | last line | for "*Chrysops*" | ,, *Chrysopa*. |
| ,, | 244 | line 39 | for "Schwelsingen" | ,, Schwebsingen. |
| ,, | 253 | ,, 41 | ,, "*Dycinatus*" | ,, *Dyscinetus*. |

## ERRATA—*cont.*

| | | | | |
|---|---|---|---|---|
| Page 270 | line 27 | for | " *Chrysorrhaea* " | read *Chrysorrhoea.* |
| ,, 279 | ,, 10 | ,, | " *krassi* " | ,, *kraussi.* |
| ,, 280 | ,, 35 | ,, | " *furfuris* " | ,, *furfura.* |
| ,, 283 | ,, 53 | ,, | " *crategi* " | ,, *crataegi.* |
| ,, 287 | ,, 36 | ,, | " *Helephorus* " | ,, *Helophorus.* |
| ,, 292 | ,, 7 | ,, | " *xanthomelana* " | ,, *xanthomelaena.* |
| ,, 293 | ,, 28 | ,, | " Themo." | ,, Thermo. |
| ,, 295 | ,, 25 | ,, | " Herrick (G. W.) | ,, Fink (D. E.). |
| ,, 303 | ,, 3 | ,, | " *Chaliodes* " | ,, *Chalioides.* |
| ,, 315 | ,, 44 | ,, | " *Rivista* " | ,, *Revista.* |
| ,, 316 | ,, 6 | ,, | " *bascana* " | ,, *bassiana,* |
| ,, 317 | ,, 22 | ,, | " Pospelow " | ,, Pospielov. |
| ,, 364 | ,, 28 | ,, | " данньмъ " | ,, даннымъ. |
| ,, ,, | ,, 33 | ,, | " N. B. Kurdjumov " | ,, N. V. Kurdjumov |
| ,, 369 | ,, 26 | ,, | " Tambow " | ,, Tambov. |
| ,, ,, | ,, ,, | ,, | " Saratow " | ,, Saratov. |
| ,, 385 | ,, 6 | ,, | " Keru " | ,, Kern. |
| ,, ,, | ,, 31 | ,, | " *Ceutorhynchus* " | ,, *Ceuthorrhynchus.* |
| ,, 387 | ,, 28 | ,, | " *saturalis* " | ,, *suturalis.* |
| ,, 390 | ,, 24 | ,, | " *Tryptolaemus* " | ,, *Cryptolaemus.* |
| ,, 392 | ,, 41 | ,, | " nashornkafers " | ,, Nashornkäfers. |
| ,, 395 | ,, 1 | ,, | " сосноый " | ,, сосновый. |
| ,, ,, | ,, 25 | ,, | " озимаго или " | ,, озимаго рапса или. |
| ,, 397 | ,, 26 | ,, | " Kischenev " | ,, Kishinev. |
| ,, ,, | ,, 29 | ,, | ,, | ,, ,, |
| ,, ,, | ,, 41 | ,, | " Gurtel " | ,, Gürtel. |
| ,, 402 | ,, 27 | ,, | "puparia by *Campsilura* " | ,, puparia of *Compsilura.* |
| ,, 404 | ,, 6 | from foot | " *pomelaria* " | ,, *pometaria.* |
| ,, 419 | ,, 3 | for | " *mitidalis* " | ,, *nitidalis.* |
| ,, 431 | ,, 5 | ,, | " *Dasterius* " | ,, *Drasterius.* |
| ,, 433 | 4 | ,, from foot for | " *maculicorius* " | read *maculicornis.* |
| ,, 453 | ,, 37 | for | " *Austin* " | read *State College.* |
| ,, 461 | ,, 42 | ,, | " *Kischinev* " | ,, *Kishinev.* |
| ,, 470 | ,, 34 | ,, | " *Obstzückter* " | ,, *Obstzüchter.* |
| ,, 474 | ,, 35 | ,, | " *Agriculture* " | ,, *Horticulture.* |
| ,, 483 | ,, 9 | ,, | " Туляьской " | ,, Тульской. |
| ,, 488 | ,, 39 | ,, | " навлюденіямъ " | ,, наблюденіямъ. |
| ,, ,, | ,, ,, | ,, | " зитомо—" | ,, энтомо— |
| ,, 491 | ,, 15 | ,, | " Бюллетні " | ,, Бюллетени. |
| ,, 492 | last line | | " *vittata* " | ,, *vittula.* |
| ,, 493 | line 1 | ,, | " Тякущіа раъоты " | ,, Текущія работы. |
| ,, 499 | ,, 1 | ,, | " извѣстіяа " | ,, извѣстія. |
| ,, 510 | ,, 36 | ,, | " *cattapa* " | ,, *catappa.* |
| ,, ,, | ,, 37 | ,, | " proboscis " | ,, ovipositor. |
| ,, 511 | ,, 11 | ,, | " miles " | ,, feet. |
| ,, 522 | ,, 27 | ,, | " деревьеьъ " | ,, деревьевъ. |
| ,, 527 | ,, 37 | ,, | " Clarke (John M.) " | ,, Felt (E.P.). |
| ,, 538 | ,, 39 | ,, | " гическои " | ,, гической. |

## PREFACE.

In the summer of 1911, when the Prime Ministers of the Self-governing Dominions were present in England, they were invited by the Secretary of State for the Colonies to discuss with the Entomological Research Committee (appointed by the Colonial Office in 1909) certain proposals for furthering and co-ordinating the investigation of injurious insects throughout the Empire. At this meeting it was unanimously agreed that the establishment of a central organisation for this purpose was desirable, and consequently a tentative scheme was submitted for the consideration of the Colonial Governments concerned.

At a further conference, held at the Colonial Office in August 1912, the matter took more definite shape, and it was proposed to form an Imperial Bureau of Entomology, to be supported by contributions from the various Dominions and Colonies, as well as from the British Government. The principal functions of this Bureau will be to collect and co-ordinate all information bearing upon injurious or useful insects; to organise a system for securing the authoritative identification, with reasonable promptitude, of all insects of economic importance submitted by officials connected with Departments of Agriculture or Public Health throughout the Empire; to compile gradually a comprehensive card-index to the whole literature of the subject; and to publish monthly the present journal, which is intended to give an up-to-date epitome of the current literature.

The Bureau is fortunate in having secured as its President so eminent an administrator as the Earl of Cromer, and the names of the many distinguished gentlemen who have been good enough to act on the Honorary Committee of Management will be sufficient guarantee that its work will be carried out in an efficient and sympathetic manner.

It is not perhaps generally realised how numerous or how varied are the existing publications which are liable to contain entomological information. A preliminary survey of the subject has resulted in the compilation of a list (by no means complete) of no less than 1,700 periodicals,—scientific, agricultural and medical,—which may contain articles dealing with entomology. And even if it should prove that nearly one-half these journals will never contain any matter to which reference need be made in the pages of this Review, yet the material that remains is still sufficiently formidable. Furthermore, the number of periodicals expressly dealing with Economic Entomology is steadily growing from year to year; and this is due not only to a more general recognition of the high importance of this subject both in its

(28111—2.) Wt. P 2601. 2500. 2 13. D & S.

agricultural and medical aspects, but also to the greater activity in the development of tropical areas, where the depredations of insects are most severely felt.

It may be said with some degree of certainty that there is at present no single institution in the world at which all these multifarious journals may be consulted, and it is hardly necessary to insist that if the individual workers in the Empire, who are concerned with Economic Entomology in one or other of its various aspects, are to be kept adequately informed as to the observations and discoveries that are being made elsewhere, some centralised system for the publication of a compact yet comprehensive survey of the subject is in the highest degree desirable.

The perfection of such an organisation must needs take time: nor can its ultimate success be assured by the efforts of the Committee of the Imperial Bureau of Entomology alone. This is essentially a matter for co-operation. It is therefore to be hoped that all persons in the Colonies who are interested in the practical application of Entomology to agriculture or medicine will endeavour to see that the Bureau shall be promptly supplied with all local publications bearing on these subjects, and also be advised of any new observations that may be made, in order that such information may be rendered accessible to workers in other parts of the Empire with the least possible delay.

From one of the Dominions comes the useful suggestion that the Government Entomologist in each contributing Colony should send every month, for publication in this Review, a brief statement (never to exceed 300 words) giving a concise summary of the outstanding features of his current work. There can be little question that such a general survey would prove both interesting and useful, but it is obvious that its accomplishment must rest in the hands of the official entomologists concerned. It is sincerely to be hoped that it may be found feasible to carry the proposal into effect.

While the principal object of this Review is to afford such assistance as may be possible to those whose business it is to combat injurious insects in the interests of humanity, yet it is confidently anticipated that its pages will prove useful to a still wider public. To entomologists in general it should be a matter of congratulation that their favourite study, whose importance is now at last receiving a somewhat tardy recognition, should be made the subject of so valuable and instructive an experiment in Imperial co-operation: an experiment which has only been rendered possible by the generous financial support accorded by every British Colony.

THE EDITOR.

**Seaver (F. J.). The Leopard Moth** (*Zeuzera* sp.).—*Jl. N. York Bot. Garden.* XIII. No. 154. Oct., 1912. pp. 155-160.

This destructive pest was introduced into the United States from Europe. It was reported in Brooklyn about twenty years ago, and is now thoroughly established in the east. In the New York Botanical Garden the trees most commonly attacked are the maples, especially the silver maple and the sugar maple. Ash trees, box, elder, basswood, and pin oak are also attacked. A few larvae have been obtained from cultivated shrubs, *Spiraea sp.* and *Viburnum opulus*. It is said to attack the elm and the tulip tree, but no evidence in support of this has been obtained in the Garden.

The damage is caused by the larvae boring in the wood of the branches or stem of the trees attacked. The attempts on the part of the tree to heal the wound result in the formation of large unsightly scars. The attack can be detected in its early stages by the presence on the ground of the partly digested wood thrown out of the burrows excavated by the larvae. When the burrow is sufficiently large the opening is closed by a whitish, semi-transparent, web-like membrane.

The larvae actually in the tree may be killed either by injecting a poison, such as carbon bisulphide, into the burrow and stopping up the hole with putty, or by removing the larvae with a wire provided with a hook or barb at the end. The latter method is the better. Smaller infested branches on old trees should be removed and destroyed, and small trees which are badly infested in the main stem should be replaced by healthy specimens. Local inspection of trees and destruction of larvae should yield beneficial results.

*Mededeelingen van het Proefstation Midden-Java.* No. 4, 1911-12. pp. 17-23.

The cacao moth, *Acrocercops (Zaratha cramerella*, Sn., is prevalent over the whole of Java. Careful observations are being made by Dr. Roepke, Director of the Experiment Station (Salatiga), on the life-history of the species and on the action of various insecticides; the resistant qualities of the different varieties of cacao are also being investigated. He is of opinion that there are three species of Ichneumonidae which may prove to be really useful parasites of the moth. The *Helopeltis* bug (Capsidae) has done much damage. The hybrid cacao known as Djati Roenggo is being cultivated, as being more resistant to the pest, and the black cacao ant is being introduced into the plantations, in some cases with success. The "white louse" (witte luizen) and the black ants are being studied in the laboratory and the following enemies of the "white louse" have been discovered: (1) a small species of Chalcid; (2) the caterpillar of a Lycaenid butterfly, *Spalgis epius*, Westw.; and (3) a small species of fly related to *Diplosia*.

Cacao borers continue to be troublesome in the Selokaton district. Much still remains to be done for their thorough investigation. On one estate the Longicorn beetle, *Glenea sp.*,

appeared to predominate, whilst on a neighbouring one the pest was another Longicorn, *Pelargoderus sp.* The persistent collection of the beetles kept them within bounds on one estate. In the badly attacked gardens small heaps of cuttings of Ficus and cacao were being used as traps and it was expected that *Pelargoderus* would breed in them; proof of this is awaited with interest.

The cacao weevil, *Alcides sp.*,* is common all over the district of Randoe. The Director saw in East Java long stretches of country in which this pest rendered cultivation almost impossible. In the month of June about a hundred specimens of cacao were received from a plantation in Salatiga, all of which had been attacked by the *Alcides*. The insects had all been removed, to prevent further spread of the pest.

The "ring-borer" is sporadic and only found on some plantations. Dr. Roepke suggests as a remedy the stopping of the holes with small wooden plugs smeared with fluid tar; this kills the borer and does no harm to the tree, and, further, it can be carried out before the damage has gone far.

Material was constantly received showing damage by a boring caterpillar which lives on the ripe and unripe cacao pods. Pupation takes place in strong cocoons, built up of excrement spun together and fastened either to the pod itself or close to it; the cocoon exhibits on one side a peculiar prolongation resembling the neck of a retort. The imago is a small Noctuid moth, not yet determined. It is not uncommon to find 10-20 of these caterpillars in one pod; but at present the insect causes no damage worth mentioning, as the attack is always confined to individual pods.

The *Zeuzera* borer (COSSIDAE) is nowhere numerous; parasites of this moth have been found.

In the months of April and May quantities of small beetles of the family HALTICIDAE were sent in from Semarang as causing damage to cacao plants. They have no metallic lustre and are more like red-brown ladybirds, but differ from them in that they have a remarkable power of jumping. They eat a number of holes in the youngest leaves and do not touch the older ones. If the attack be severe the whole seedling dies off. This beetle was not known until recently and has not been determined. It has been kept for many weeks in captivity without laying any eggs, so that its mode of development is still unknown.

"Slug caterpillars" belonging to various species of LIMACODIDAE are not infrequent on cacao, as well as on other crops, but generally they disappear without doing any serious damage. These larvae have been received at the Station as damaging cacao in the Ambarawa district and include two different species of the genus *Belippa*, which, because of their resemblance to the pith of the "Arènpalm" (*Arenga saccharifera*), are called by the natives "oelar kolangkaleng."

* [*Alcides leeuweni*, Heller (Deut. Ent. Zeit. 1911, p. 312), the life-history of which has been recorded by Dr. van Leeuwen (Deut. Ent. Zeit 1910, p. 268).—ED.]

This pest is not of much importance, as it is already being kept down by collecting the caterpillars systematically.

Ants' nests, hanging to the trees on a plantation at Salatiga, were found to be constructed of the leaves of young bamboo shoots and to be infested by an as yet undetermined species of rat, presumably in search of these shoots (sloembring) which might possibly be used in other places as bait for the rats.

The Scolytid beetle, *Xyleborus coffeae*, the native name of which is "boeboek," is local and some plantations are entirely free from it; but even in the areas which may be called its home it has given no great cause for anxiety. It appears that a small Ichneumonid (sluipwespje) or Braconid holds the pest in check. Instructions were given to attempt to catch this coffee borer (*Coffea robusta* is named throughout as the species of coffee attacked and the insect is referred to as the "robusta-boeboek") by means of lanterns; but the experiments failed signally, not a single *Xyleborus* being taken. Other bark-beetles came to the light which had enough resemblance to *Xyleborus* to be possible sources of error. It would appear to be the view of the authorities that if the plantations of *C. robusta* are well looked after, all damaged branches lopped and decaying trees felled, the "boeboek" pest is not much to be feared.

Caterpillars on the flowers of *C. robusta* occur everywhere. The damage is sometimes insignificant, but occasionally very considerable. The species implicated belong to the families TINEIDAE, TORTRICIDAE, NOCTUIDAE and GEOMETRIDAE, the larvae often destroying the berries as well as the flowers; but it is very difficult to ascertain which species does the serious damage. Dr. Roepke is of opinion that most *C. robusta* trees, though not all, which are infested with the "white louse" and ants are specially liable to this caterpillar attack and that the thorough cleaning of the trees from these will mitigate the pest. Tobacco or soap sprays will probably prove effective remedies.

DEWITZ (Dr. J.). **Bearbeitung der Literatur der Traubenwickler** (Review of the literature of the vine moths) **Nr. 2.**—*Bericht der Königl. Lehranstalt fur Wein, Obst und Gartenbau zu Geisenheim a. Rh. fur das Etatsjahr*, 1911. (Berlin, P. Parey, 1912.) pp. 218-277.

*General Bionomics of* Clysia (Conchylis) ambiguella *and* Polychrosis botrana.

It is obviously a matter of importance to make careful observations of the exact date of appearance of the moths in each year. This date is very largely a question of temperature, and will consequently vary with the locality and the season. The moths lay their eggs on the buds, and it has been found useful to set up lamps for catching them as soon as the latter appear, about 10 lamps being used to the hectare (rather more than 4 to the acre). Another plan is to breed out pupae in the open near the vineyards and time the operations according to the date of appearance of the imago. An infested vine enclosed in a muslin

net has been found a simple and effective means of making these observations. This method though useful in the case of *Clysia (Conchylis) ambiguella* cannot be relied upon for *Polychrosis botrana* which is not easily taken with the lamps, and systematic "drives," in the direction of the wind, of definite areas in the vineyard are recommended. In some of the wine-growing districts of France "warning stations" (stations d'avertissement) have been in operation since 1904. Observations made in Germany between 1856 and 1890 give May 17th as the mean date of attack, May 1st (1869) as the earliest and June 1st (1879) as the latest date of appearance of the pest. It is more or less determined that the moth appears in the Gironde 8 days later, and in the neighbourhood of Saumur, Anjou, Paris and Champagne 14 days later than on the Mediterranean.

The life period of the first generation varies with temperature and general weather conditions and therefore with the district. In the Gironde, in normal years, 8 days seem to be the average. *Polychrosis botrana* is found on the wing about dawn and again in the twilight. *C. ambiguella* attaches itself during the day to the underside of the leaves or on the shady side of posts, etc., and begins to fly about two hours before sundown, continuing till midnight and, in warm weather, the whole night long. One observer in the Moselle district says that in fine warm weather, and even when cloudy and a fine rain is falling, about 9 a.m., and again from 6 p.m. onwards, the moths flutter round the vine-stocks and that at these times more may be caught with the racquet in a few minutes than in an ordinary half day.

They appear to be carried great distances in windy weather and on the whole to be more abundant on the edges of vineyards near to field-roads and ditches than in the centre. This is probably due to their tendency to fly towards the light.

They also seem to frequent by preference vineyards in which the leaves are abundant and well developed—as they there find shelter from the sun and heat. It has been observed that when the temperature is continuously high the moths of the second generation disappear suddenly. Experiments have shown that a temperature of 35° C. (95° F.) is fatal to them.

The moths (*C. ambiguella*) begin to move about 3 to 4 days after emergence and then copulation takes place; the eggs are laid about 8 days later and the whole life of the female has been computed at not more 3 weeks. The same appears to hold good of *Polychrosis botrana*. The eggs are generally laid before sundown. Estimates of the number of eggs laid by each female vary. The ovaries contain usually 150-200 and the number actually laid is possibly 120-130. In the second generation the number of ovarian eggs diminishes greatly, falling to 30 or less, and the number actually laid is proportionally smaller.

The first generation oviposits on the flower-buds and flower-stalks, the second on the fruit and fruit-stalks, and the third generation appears to seek the berries which have been already damaged by the previous brood. There is some evidence that in choosing a place for her eggs, the female of *Polychrosis* endeavours to seek a smooth surface. Bunches of grapes which

had been experimentally covered with a powder or a sticky substance were found to be avoided; further, grapes exposed to the sun were much less attacked than those in shade. One observer fitted paper hoods to more than 300 bunches, leaving them open below and found three times as many caterpillars in the shaded than in the unshaded bunches. According to some authorities the female of the first generation of *Polychrosis* exercises considerable choice as to the variety of grape on which to deposit her eggs and tends to select the early flowering ones. A difference of 10 days in the flowering time of two sets of vinestocks resulted in the early-flowering ones being covered with caterpillars and the late-flowering ones being free.

The eggs of *C. ambiguella* have been found on the following wild plants:—*Euonymus europaea*, *Viburnum opulus*, and on *Cornus mas*.

Periods of intense heat seem to be fatal to the eggs of both *C. ambiguella* and *P. botrana*. This was observed to be the case in the hot summer of 1911, during two very hot weeks in September 1906, and during the prevalence of a very hot wind in August 1892. Experiments show that a temperature of 40°-45° C. (104°-113° F.) destroys the vitality of the eggs of *P. botrana*. Continued bad weather appears to have a double effect: it not only interferes with the actual deposition of the eggs, but the eggs when laid largely fail to develop, due it is believed to changes which take place owing to detention in the oviducts.

The practical result of these observations is to favour the method of cultivation which permits the greatest exposure of the grapes to the sun and weather.

*Destruction of the moths with sticky racquets.*

These racquets (Klebfächer; racquettes engluées) are made of perforated metal or wire gauze smeared with some sticky substance: a mixture of 25 parts resin and 126 parts linseed oil, boiled together, is found satisfactory. It is essential that the material should remain sticky when in use and not become covered with a hard film. The racquets are 25 × 30 cm. (10″ × 12″), the upper edge being bent over to a half cylinder. The handle is about 18″ long with a cleft at one end in which the sheet of metal can be gripped. The sticky racquet is held in the right hand and the vines beaten with a stick held in the left; the moths fly out and are swept up with the racquet. When it becomes foul, or ceases to be effective, the metal plate is held over a fire and the oil and dead moths burned off. The cost of the appliance is very small and the results of its use are excellent. As many as 300 moths may often be caught in an hour by one boy. In the Gironde *P. botrana* is kept down by this means, but instead of one, two racquets are used, one in each hand. The operation must be very thoroughly carried out and as many persons as possible employed at once, and if the vineyard be not isolated it should be repeated several times. Opinions differ, but on the whole the late afternoon and evening appear to be the best times for the work, and also the very early morning just

before and after dawn. Dull cloudy days are best. The figures from a vineyard of about 22 hectares (50 acres) for the years 1901-1905, both inclusive, are as follows:—For the two generations combined, thousands caught, 306, 190, 49, 38, 25, the ratio of first and second generations being approximately 1 : 2; in addition, the captures by lamps at night were for the respective years 72, 19, 15, 8, 2, making a grand total of 726,462 moths captured. The total cost for the 5 years was 38,145 marks and the net extra profit obtained was reckoned at 289,449 marks.

The results obtained by G. Farini near Padua are quoted for the 10 years 1890-99. In 1892 he captured 14,000 moths of the first generation between 26th April and 21st May, and 2,417 of the second generation between 28th June and 12th July. In 1893 17,000 and 1,500 respectively. In 1894 24,600 and 1,500. In the years 1897-8-9 the figures for the first generation were 26,160, 11,269 and 23,278. These results were considered good and the damage done was small. In another vineyard 18 work-people in 27 days captured 20,230 moths, an average of 41 moths per head per diem. Cloths smeared with some sticky substance and stretched between the rows of vines have not proved successful, and the use of insecticides mixed with treacle or sugar and sprayed on to the vines more or less failed because of the difficulty of preparing a solution which is not liable to dry up or be washed off by rain.

*Use of lamps and lights of various kinds.*

The attraction of various monochromatic lights for the moths has been investigated by Perraud (Pr. agr. vit. 1, 1904, pp. 722-23). He found that white lights attracted 33·3 per cent., yellow 21·3 per cent., green 13·8 per cent., orange 13 per cent., red 11·5 per cent., blue 3·9 per cent., violet 2·2 per cent. Other investigators have found a green light decidedly the most attractive. It appears also to be fairly well established that a diffused light is more attractive than a naked one, and that a very intense light is by no means so attractive as a somewhat feeble one, *e.g.*, oil, petroleum and even candle lanterns appear to be more effective than acetylene lamps, and on the whole petroleum lamps are the best. In the German vineyards the following form of lamp is largely used. A large drinking glass is half-filled with good oil and a floating wick arranged with a piece of cork and 3 pins stuck into it so that the wick shall not touch the sides of the glass. The upper part of the glass is wrapped round with paper smeared with some sticky substance.

The necessity for the constant renewal of this latter causes a serious amount of labour and consequently the lamp is often set in a shallow tray of water.

Acetylene lamps have been extensively tried in France and prizes offered for the most effective and cheapest, not costing more than 10 centimes per lamp per night. The price of such lamps worked out at 6·25 fcs. to 7 fcs. each, which renders their use impracticable, at least in the South of France, where 10 lamps to the hectare is the usual number, so that lamps for an area of 500 hectares (1,125 acres) would cost about £1,300 sterling.

Experiments have been made in wiring vineyards so that small 5 c.p. lamps fitted with a sticky paper shade could be arranged at regular intervals and at any desired height above the ground. The proper height is not easily determined, but 70 cm. (28") appears to have yielded the best results. The radius of action of lights has been investigated and it has been found that while *C. ambiguella* was attracted at a distance of 25 m. (28 yds.), *P. botrana* was not: and generally speaking it would appear that the latter is not so much attracted by light as the former, though some observers have captured large numbers of *P. botrana* in this way. The methods adopted in the different cases are perhaps not strictly comparable. An essential condition for success with either species is that the night should be warm, quiet and dark. During periods of drought the moths are more difficult of capture. Moonlight and gusty weather tend greatly to prevent capture by lamps.

Experiments with lamps in a vineyard on the Moselle, 2-7 Aug. 1899, 5 nights with an average of 161 lamps per night, resulted in the capture of 18,639 moths, or an average of 23·1 moths per lamp and night. There was on an average one lamp to every 600 vinestocks, much too small a number for the tall and large vines of the district. The lamps should not be more than 14-16 m. apart. In the same vineyards, from 24th July to 3rd Aug. 1900, 54,591 moths were caught with lamps at a cost of 2,612 marks (£130), *i.e.*, the capture of each 21 moths by this method cost about one shilling.

Careful observations have been made by David and Laborde at La Maqueline in the Gironde in the years 1898-1901. In 1900, 80,000 moths of the second brood were caught on 120 hectares (270 acres), and it was hoped that there were none remaining, but in August, a very short time after the operations, an average of 5-10 caterpillars per vine-stock was collected, *i.e.*, 1,200,000 in the whole vineyard. In 1901 the same vineyard was fitted with 1,200 lanterns, with the result that from 7th to 24th July (second brood) 100,000 moths were taken, of which about 60 per cent. were males and 40 per cent. females. Of the females only 1 in 5 were believed not to have laid any eggs. It was computed that 496,000 possible caterpillars were thus prevented from developing. The total cost was 1,600 fcs. (£64).

In Verzenay on 6 hectares (13½ acres) with 117 electric lamps (5 c.p.), between 4th July and 4th August 1910, 20,915 *C. ambiguella* and 251,270 *Sparganothis (Oenophthira) pilleriana* were taken.

*Use of baits.*

It has been observed that in those parts of vineyards which have been used for the deposit of dung, more moths are to be found than elsewhere. Dewitz (Zeit. Wiss. Insektenbiol. I, 1905, pp. 193-99, 237-47, 281-85, and 338-47) has determined that the odour of the nectaries of the vine flowers attracts the moths and invites them to lay their eggs on the buds.

This habit of the moths has been largely made use of for their destruction with considerable success. Various mixtures

have been tried, cider, beer, vinegar, wine made from the grape waste (Trester-wein), beer mixed with sugar, sugar solution flavoured with fruit ethers or extracts of aromatic plants, vinegar and sugar, and many others. Apple pulp in water, to which a few drops of fruit ethers were added, has yielded excellent results in the Pfalz, 20,000-40,000 moths being captured in some vineyards in 24 hours with a large number of glass flytraps baited with this mixture.

Labergerie (Revue de Viticulture, xxxvi, 1911, pp. 612-614), using only molasses diluted with water exposed in 3,000 earthenware and 200 tin vessels, captured about 60,000 *Clysia (Conchylis)*, 30,000 *Polychrosis* and more than 200,000 caterpillars of *Sparganothis (Oenophthira)* between 15th May and 15th September, 1911.

The results of the method of capture by bait lead to the following conclusions. The various wine mixtures are the best and the addition of fruit ethers is unnecessary. The commencement of fermentation renders the liquid more attractive. The neighbourhood of certain plants, such as, Ampelopsis, ivy currants, gooseberries and other strong-smelling plants, should be avoided in setting the traps. White dishes appear to be more attractive than red or other earthenware. Metal dishes are to be avoided. The traps should be set in the shade. The second brood is the one most readily caught by this method. The warmer weather prevailing at the time of their appearance has possibly a considerable effect on the results; the odour is more readily distributed, the moths are more active and it is the season observed by collectors to be the best for catching by baits.

As it is more or less well established that the moths avoid various strong odours, attempts have been made to keep them away by the use of "Rubina" a preparation of wood-tar and caustic soda, much used in Italy as an insecticide. Chloroform, sulphuretted hydrogen, nitrobenzol, tar, essence of orange flowers, peppermint, eucalyptus, rosemary, cinnamon, geranium, melissa and even asafoetida have been tried. Capus and Feytaud (Revue de Viticulture, xxxiii, pp. 231-37) sprayed with solutions of nicotine and of barium chloride and found that in both cases the number of eggs laid on the sprayed vines was much less than on the unsprayed. Bordeaux mixture was found to have a similar effect.

The reports of different observers as to the relative proportion of male and female moths captured by the various methods, show little or no consistency, and the possibility of serious error in dealing with large numbers of moths must not be overlooked. It seems to be more or less definitely established that on warm quiet nights more females than males may be captured by either the racquet or lamp method and *vice versa* on cold or windy nights. The traps also seem to yield more males than females, but the proportion varies with the local conditions.

A very full bibliography of the subject accompanies the report.

MORSTATT (H.), Amani, German E. Africa. **Pests of Camphor Trees.**—*Der Pflanzer*, VIII. 1 Jan. 1912. pp. 16-24.

The author states that all camphor tree pests known to date in the Colony are indigenous and have migrated from their native food plants to the camphor.

STINKING GRASSHOPPER.—*Zonocerus elegans*, Thb., is found on the young trees as a rule only when the weeds and other natural food-plants are either consumed or dried up. It eats only the youngest yellow shoots and is very irregular in its appearance as a pest.

WEEVILS.—*Dicasticus gerstaeckeri*, Faust, is plentiful on many wild and cultivated plants, but irregular in its appearance as a pest: *e.g.*, plentiful on camphor trees in Amani in 1910, all but absent in 1911. Eats only the young shoots and the edges of very young leaves. Easily shaken off the trees and collected. The author kept two of the weevils alive for 18 months on a diet of camphor shoots only. *Systates irregularis*, Fst., plentiful on other plants and occasionally visits camphor.

CAMPHOR BORER. *Tragocephala pretiosa*, Hintz, behaves in much the same way as the yellow coffee borer. The female gnaws a series of holes in the bark of a twig, often ringing it completely, and deposits her eggs in them. The larvae first attack the outer end of the twig or branch, but soon turn about and bore in the opposite direction. The young twigs drop off and branches are frequently destroyed. The tunnels often break through the bark. The total life cycle appears to be two years. An affected branch cut in Wilhelmstal in March contained the perfect insect in November. The twigs drop off in the hot weather at the beginning of the year and large larvae can be found in the branches, in August the pupae, and in November the perfect insect. The pest is fortunately easily combated. In January and February the attacked twigs are sawn or cut off an inch or two below the bored spot and burned, and as at this period the larvae have not had time to bore far, their capture and destruction is assured. In Amani, the year following this treatment, the pest had practically disappeared.

BUGS.—From September, 1907, to February, 1908, the young camphor trees at Amani exhibited serious injury to the twigs and dry tips which agreed with the attack of the cinchona bug. They have been traced from the cinchonas to the camphor trees. They suck only the growing points and leaf buds, so that the former are killed and consequently the twigs remain short and numerous new buds are formed so that an abnormal bushy condition of growth results. The damage rarely extends to trees grown with a single stem, especially if they are of some age.

SCALE INSECTS.—*Aspidiotus destructor*, Sign., the coconut palm scale is not uncommon on the under side of the leaves of the camphor trees. Another species *Aspidiotus cyanophylli*, Sign., is also found on camphor, but neither species has as yet risen to the rank of a pest.

MOORE (W.), Lecturer in Entomology, Sch. of Agric., Potchefstroom. "**The Pepper Tree Caterpillar**" (*Bombycomorpha bifascia*, Wlk.)—*Agric. Jl. of the Union of S. Africa.* IV. Oct. 1912. pp. 539-542.

This pest has for several years past stripped the "pepper trees" grown for shade at Klerksdorp, Transvaal. The eggs of the first brood are laid about the beginning of October in a band about one inch in length around the petiole of the leaf or on a young twig. They hatch in about 20-25 days and the caterpillars are generally gregarious. They feed at night, congregating round a small limb in the daytime, and reach maturity in about 40 days or near the middle of December. The cocoons are oval, made up of hair from the body and dirt, and are generally most abundant on the ground under the infested tree, though they are to be found on the limbs of the trees and elsewhere. Moths of the second brood appear about the end of February and the caterpillars from the eggs laid by them are found on the trees in April, being fully grown by the end of May and passing the winter as pupae.

The pest is widely distributed over the country and its work has been noticed in Pretoria, Warmbaths, and on a few trees in Potchefstroom. It is a native of South Africa and has been noticed on the Karee Boom, which is probably its native food-plant. This tree is common near the Vaal, which may account for the abundance of caterpillars at Klerksdorp.

About 25 per cent. of the caterpillars collected on December 12th were parasitised by a Tachinid fly. As the caterpillars were protected for a week before pupation the percentage would probably be higher in the natural state. Unfortunately the period of oviposition of this fly does not correspond with the appearance of the various broods of caterpillars sufficiently to be of much real service. The fly also often lays its eggs on the caterpillar just before a moult and the latter consequently escapes.

REMEDIES.—Collect as many cocoons under the trees as possible and spray the leaves with 2 lb. lead arsenate to 100 gals. water during April and May.

FULLER (Claude), Government Entomologist, Natal. **White Ants in Natal.**—*Agric. Jl. of the Union of S. Africa.* IV. Oct., 1912. pp. 542-571.

*Attack on Houses.*—As the result of much careful observation the writer lays stress on the importance of raising houses 2 or 3 feet above the ground and admitting all the light and air possible to this space between the soil and the floor-joists. Tiled floors should be laid on concrete beds supported by ironwork. Piers used as supports should not be "brick boxes filled with earth and the debris of building operations" but should be empty and have openings to allow light and air to enter freely. Jarrah piles may be used as this wood is not attacked, or, if the pillars are of brick or stone, these should be set in sand and cement. White ants cannot tolerate constant disturbance. They will eat up a deserted Kaffir hut and never approach an inhabited one.

*Attack on fruit trees and plantations.*—The Natal termites will not eat peach trees, and advantage has been taken of this to graft most plums on to peach stocks. Apricots, apples and pears are commonly attacked; citrus trees, anonas, bananas, avocados, mangos and loquats are to all intents and purposes exempt from attack. The termite attack on wattle plantations is serious. The best precaution is to clear the land of them thoroughly before planting. Damage is generally done in the first three years and 30 per cent. of the trees may be lost if no precautions be taken. After this period there is enough litter under the trees to satisfy the termites and they let the trees alone. When more or less under control fresh galleries or run-ways of the pest must be constantly sought for and traced by blowing smoke into them with a fume machine. The smoke enables the nest to be located and destroyed. These galleries have been known to extend 90 feet or more from the nest in the case of the "Natal termite."

Timber for building purposes, posts, etc., are best preserved by soaking for 2 or 3 days in a 10 per cent. solution of arsenite of soda in water or by creosoting. Charring the lower ends of posts is only of use when it is made to extend some distance above ground as well as below.

*Mededeelingen van het Deli Proefstation.* Jahrgang VII. Oct., 1912. pp. 129-146.

*Imported Parasites.*—The Director of the Station reports that satisfactory results have been obtained from the importation from the United States of the eggs of a Chalcidid, *Trichogramma pretiosa*, Riley, to serve as a control for *Chloridea (Heliothis) obsoleta*, F. The eggs were brought from the United States in cold storage, and only a very small percentage failed to hatch. As in the U.S.A., so in its new home, it has been found not to be exclusive in its tastes, the eggs of over a dozen different species of Lepidoptera having been attacked by it. This is a fact of the greatest importance, as if it confined its attention to one species and that species should fail or not be available for a considerable portion of the year, the parasite might die out from want of its peculiar host. This is not likely to be the case in Sumatra, for the authorities at Deli have found it infesting *Tiracola (Arcilasia) plagiata*, Wlk., *Ophiusa*, *Deiopeia* and *Remigia*, all well-known pests of local crops.

The number of flies produced from one egg was found to be very variable. Eggs of *Chloridea* and *Prodenia* yielded 1, 2 or 3, rarely 4; of *Remigia*, 6, 7, 8 and even 12.

It has further been discovered that *Trichogramma* parasitises various other Lepidoptera which feed on wild plants and which may possibly change their habit and invade the cultivated areas.

It is now established that *Trichogramma* in Deli has passed through 16 generations in the free state and that it has multiplied. At various dates between 18th Sept. 1911, and 12th Feb. 1912, numbers of laboratory-bred *Trichogramma* were released on the experimental plots at Serdangweg. At the end of July, eggs of *Ophiusa* and *Chloridea* were collected and yielded *Trichogramma*,

the laboratory period for a generation of which is 8-10 days. It is known that *Chloridea* prefers to lay its eggs upon the maize tassles and the following experiments were made:—

Three plots of flowering maize, (*a*) (*b*) (*c*), were taken and boxes, each containing several dozen *Trichogramma*, were distributed as follows:—One each on (*a*) and (*b*) and two on (*c*). Eggs of *Chloridea* were collected the next day from the maize tops as under:—(*a*) 13, of which none were infected; (*b*) 7, with 6 infected; and (*c*) 22, with 9 infected. An earlier experiment failed owing to drought. It is thus claimed that *Trichogramma* is capable of propagating itself in Sumatra and that its introduction will be of great practical utility.

*Insecticides for Tobacco.*—The use of Schweinfurt green in place of lead arsenate as an insecticide by tobacco planters, seems to be increasing. The Director of the Deli Expt. Station is of opinion that the difference in price is the cause and the unnecessary waste of the arsenate, which should be largely diluted with tapioca flour (or earth finely sifted). For use as an insecticide it has the great advantage over the Schweinfurt green that it does not damage the tobacco leaf. There is often great waste of material by planters, due to their not taking the weather conditions into proper account when applying insecticides. There is great need of some neutral substance to be used as a carrier for the insecticide which shall in itself be attractive to the pest. All manner of materials have been tried, but the caterpillars do not eat the treated leaves any more greedily than the untreated.

*New pest of Tobacco.*—A species of hawk-moth (*Acherontia*), new at least to the Deli tobacco growers, has made its appearance in Sumatra, and it seems probable that it resembles closely, if it be not identical with, one already reported from Java.

*Imported Ladybirds.*—The Aphis-eating Coccinellid, *Megilla maculata*, de G., imported from America, has been successfully reared and supplied to various tobacco plantations in small quantities. So far as these small experiments go it seems to have been useful; but it is not yet possible to say whether the insect has established itself or not.

*Tenebrionid Beetles attacking Tobacco.*—*Opatrum* and its larvae have done great damage in Sumatra during the year to the newly planted-out tobacco; the invasion extended over the whole East Coast from Upper Padang to Upper Langkat. The spreading of earth mixed with 10 per cent. naphthalin, or building lime, between the plants will do something to save them. A dressing of lime at the rate of 5 sacks per "veld" has been found to be useful. The beetles collect under stones, bits of wood and the like, and by setting traps of this kind large numbers may be captured and destroyed.

Vayssière (P.). **Two New Coccids from W. Africa.**—*Bull. Soc. Ent. France.* XVII. 1912. pp. 366-368.

Description of two new Coccids named *Pseudococcus marchalis* sp.n. and *Chionaspis nigerensis*, sp.n.

These were collected by J. Vuillet at Koulikouso (Upper Niger) upon *Xymenia americana*, the fruit of which is edible.

Russell (H. M.) & Johnston (F. A.). **The Life History of** *Tetrastichus asparagi*, **Crawf.**—*Jl. Econ. Entom. (Concord, U.S.A.),* V, No. 6, Dec. 1912, pp. 429-433.

This Chalcidid was first recorded as a parasite of *Crioceris asparagi* (the Asparagus beetle) by H. F. Fernald in July 1909. It was observed by the authors in large numbers at Riverhead, Long Island, N.Y., in the summer of 1912. A field of asparagus at Aquobogue was being cut for market and a few rows had been left as traps; the beetles and also their eggs were found on the plants in large numbers and associated with them adults of this parasite (*T. asparagi*), 5-7 being often found on a single stalk busily engaged in ovipositing in some eggs and destroying others by feeding on them (out of 2,097 eggs counted on 28 stalks 1,495 had been thus destroyed). Adults were taken to the laboratory and allowed to deposit their eggs in eggs of *Crioceris*, but instead of adult parasites emerging only the larvae came out and died from lack of food. This surprised the authors as they regarded it as an egg-parasite, but as the adult is twice the size of the host egg, it could hardly develop to maturity within it. Mr. W. H. Fiske, of the U.S. Bureau of Entomology, was of opinion that as the egg of *Crioceris* was so small the parasite must come from that of a much larger beetle and thought that a species of *Trirhabda* (Galerucidae) which feeds on *Solidago sp.* was possibly the true host and that the habit of feeding on the eggs of *Crioceris* was only acquired.

True oviposition in the eggs of *Crioceris* however was observed by the authors and the parasite refused those of *Leptinotarsa 10-lineata* (the potato beetle) and also those of *Galerucella luteola* (the elm-leaf beetle). Nearly mature *Crioceris* larvae were collected and allowed to pupate in the laboratory; one was found packed with 6 white parasitic larvae which pupated, but all died in that stage. Only a few days later numbers of *Crioceris* were bred from larvae and three pupae of *Tetrastichus* among them. Late in July the parasites were again found in the fields behaving as before; the attempt to breed them out was repeated, and this time with success, numbers of parasitic larvae being obtained. The adult insect searches for eggs immediately on emergence and the processes of feeding and oviposition begin at once. The ovipositor is used as a drill and is thrust into the egg and withdrawn continually for about 3 minutes; the insect then turns round and sucks the egg-contents through the hole so made. Some were observed to drill for at least eight minutes before sucking; the time spent on puncturing and sucking varies however very greatly. In the laboratory 13 females, living on an average 7-8 days, destroyed 260 eggs of *Crioceris*, an average of 20 each or 2·5 per diem. The largest number of eggs destroyed by one female was 61 and the largest number destroyed in a single day was 12. So far as this investigation has proceeded, reproduction is asexual only, as in two successive generations no males have been reared. Females confined in separate vials began oviposition as soon as they emerged from the pupae.

From 1-9 adults were found to emerge from a single host larva so that apparently for every egg of the parasite one adult results; polyembryony does not appear to occur.

The field of asparagus on which these observations were made was formerly sprayed regularly to keep down the *Crioceris*, but this year (1912) they were so scarce that but little damage was done, owing no doubt to the presence of the parasite.

PIERCE (W. D.) & HOLLOWAY (T. E.). **Notes on the Biology of** ***Chelonus texanus*****, Cress.**—*Jl. of Econ. Entom. (Concord N.H., U.S.A.).* V. No. 6. Dec., 1912. pp. 425-428.

The adult *Chelonus texanus* deposits its eggs in the eggs of its host *Chloridea (Heliothis) obsoleta*, F., but the parasite emerges, not from the egg, but from the larva developed therefrom. A similar retarded development has been recorded in the case of *Encyrtus fuscicollis*, Dalm., which oviposits in the eggs of *Hyponomeuta malvella*, etc., and *Litomastrix truncatellus*, Dalm., an egg-parasite of *Plusia gamma*, etc. *Litomastrix* and *Encyrtus* are polyembryonic; *Chelonus*, so far as observed, is a single and simple parasite. The *Litomastrix* adult is only 1·9 mm. in length and the egg of *Plusia* 0·6 mm. in diameter. *Chelonus* is fully 5 mm. long and the eggs of *Chloridea (Heliothis) absoleta* are 0·5 mm. in diameter, whilst those of *Laphygma frugiperda* are smaller.

The junior author while collecting eggs of *C. obsoleta* (11th March 1911) found *Chelonus texanus* in the act of oviposition. It was taken to the laboratory and placed in a tube with about 200 *Chloridea (Heliothis)* eggs, in which it oviposited. The moth larvae emerged on March 13-15 and two parasites were reared, of which one (male) died. The other was supplied with eggs of *C. obsoleta* on a piece of corn-leaf; it examined both and forthwith began to oviposit.

In September 1912 *Chelonus texanus* was observed ovipositing in the eggs of *Laphygma frugiperda*. Fifty-seven broods of *Laphygma* larvae were kept under observation and from twenty-five of these *Chelonus* was bred. Cocoon formation took place within an average of 26 days. When about ⅛-inch long the parasitised *Laphygma* larva makes a cell supported by a fine-meshed yellow silk cocoon, and two days after completion the larva dies. The next day the parasite larva emerges from a hole about the middle of the body and spins its cocoon within that of the host, taking two days in the process. The time of emergence depends entirely on the size of the host. If it grows and feeds slowly, so does the parasite within. The presence of the parasite causes the premature spinning of its cocoon by the host.

This habit of oviposition may not be characteristic of all species of *Chelonus*. Silvestri (La Tignola dell' Olivo, Portici, 1907, pp. 154-57) describes *C. elaeaphilus* and *C. orientalis* as probably laying their eggs in the very young larvae of their hosts.

Bryant (H. C.), Assistant California State Fish and Game Commission, Univ. Zool. Lab., California. **The Numbers of Insects Destroyed by Western Meadow Larks** (*Sturnella neglecta*).—*Science*, N.S. XXXVI. 20th Dec., 1912. pp. 873-874.

There is little definite information as to the exact number of insects destroyed by birds within a given area. The food habits of certain Californian birds are now being investigated by the California State Board of Fish and Game Commissioners and the University of California, and it has been possible to collect birds in sufficient quantities for stomach examination in some 20 different parts of the State and in every month of the year.

Ranchers of the State complain greatly of the pulling of sprouting grain by the Western Meadow Lark (*Sturnella neglecta*). Of this the bird has been found guilty, but the evidence as to its value as a destroyer of insects is of greater interest.

The averages for the year are as follows: 64·6 per cent. animal food, 35·4 per cent. vegetable food; including, 7·6 per cent. beetles, 18·3 per cent. cut-worms, 26·4 per cent. grasshoppers, 22·2 per cent. grain. In March the percentage of beetles was 22·7, and in October 0·5. The percentage of cut-worms was 69 in May, and none in the months of July, August and October. The highest percentage of grain was 94 in January and 47·1 in October; in the months of April, May, June and September, none. The highest percentage of grasshoppers was 85·5 per cent. in July and only 4 per cent. in May. Grasshoppers were only found in the months of May, June, July, August, September and October. It thus appears that grain is only resorted to when insects are not available. Beetles are eaten all the year round.

The percentages given represent the comparative volume of the different kinds of food found in the stomach. In the case of cut-worms, the number is greatest when the worms are still small; thus, in February twelve birds were found to contain 360, in March 16, in April 68, in May 90, and in June 6; whereas the percentage based on volume was the highest in May (44·7) with 90 worms, the February percentage being 36·8 with 360 worms.

Meadow Larks are apparently very valuable as checks on the increase of grasshoppers; *e.g.*, 66 birds between the months of June and November 1911 were found to have eaten 738 of these insects. The largest percentage was in September, 96·3 by 6 birds and the largest average number 16·5 by 19 birds. The number of grasshoppers was estimated by counting paired mandibles.

Experiment has shown that a Meadow Lark will digest a grasshopper in between 3 and 4 hours. The numbers found in the stomach therefore represent those which had been eaten during the preceding 3 or 4 hours before the birds were killed.

In order to obtain some idea of the number consumed in a day, the average number per bird needs to be *multiplied* by 4, and it seems *safe to conclude that the* particular Meadow Larks examined were averaging almost 50 grasshoppers a day. As many as 28 pairs of mandibles were found in a single stomach.

Not all the grasshoppers destroyed can of course be considered injurious, but the main point is, that if the birds feed on insects to the extent shown in this instance, they must play a more important part as checks on the number of insects than many people would have it to be believed.

The consumption of injurious beetles was considerable. The stomach of one Meadow Lark, taken on the 20th November 1911, contained over 36 Chrysomelid beetles of the species *Diabrotica soror*. As this species is very destructive in the State, and as insecticides are seldom used, any natural check is of importance and should be recognised.

The author urges that the facts above stated are strong arguments for the protection of many birds whose economic value is now considered doubtful.

Johnson (J. C.). **Formalin as an Insecticide.**—*Irish Naturalist*, XXII, Jan. 1913, p. 19.

Owing to the remarkable efficiency of formaldehyde as a germicide and fungicide, some experiments were made in the plant-houses of University College, Cork, to determine its insecticidal power. Various solutions of Schering's formalin in water were used, giving strengths of formaldehyde of from 0·01 per cent. to 2·0 per cent. These were sprayed over plants infected with green fly and mealy bug. The results showed that any efficacy formalin might possess as an insecticide was more than counterbalanced by its injurious action on the plants.

Picard (F.). **Sur la production par le Phylloxéra de le Vigne de galles inversées sur les feuilles de *Vitis berlandieri*, Planchon.** [On the production by the Phylloxera of the Vine of inverted galls on the leaves of *Vitis berlandieri*, Planchon.]—*C.R. hebd. Soc. Biol.* 6th Dec. 1912, pp. 559-561.

It is known that the gall-producing individuals of *Phylloxera vitifoliae*, Ficht, 1854 (= *vastatrix*, Planchon, 1868) do not behave in the same way on different species of vine. These galls are numerous and well developed on *V. rupestris*, Scheele, *V. riparia*, Michx., and especially on the hybrids of *V. riparia* crossed with *rupestris*; but scarce and smaller on *Vitis aestivalis*, Michx., and *labrusca*, L.; and very rare and almost always abortive on *Vitis vinifera*, L. This abortion which is the rule in the European vine is frequently observed in certain American stocks, *e.g.*, varieties of *V. aestivalis*.

It appears to be admitted on all sides that the insect always punctures the epidermis of the upper side of the leaves, producing a gall which projects on the lower surface with its opening above, and no example of a different arrangement could be found in the bulky literature of *Phylloxera*.

At the end of the summer of 1911 the author found an example, in the Museum of the School of Agriculture at Montpellier, of

leaves of an American vine, *Vitis berlandieri*, in which the galls were inverted, that is to say the opening was on the under surface of the leaves. The author found that this condition appeared to be a peculiarity of *V. berlandieri*, as he failed entirely to find it on European stocks or on other American species and their hybrids, which however bore thousands of galls of ordinary structure in the past year. Topi has recorded similar cases in Italy, and according to him, it is the fourth generation of the insect which attacks the leaves in this peculiar manner, the reason assigned being the dryness of the weather at the time, which arrests the growth, and the insects appear to be unable to puncture the upper surface and therefore turn to the lower. Many of these galls are badly formed and badly closed, so that the eggs are often liable to be lost.

The author cannot agree with this explanation, because in the wet summer of 1912 he found these inverted galls quite as abundant on *V. berlandieri* as in the dry summer of 1911 and further, they are not found on any other stock. He attributes it to some difference of structure in the leaf.

Allard (H. A.), Bureau of Plant Industry, Washington, D.C. **The Mosaic Disease of Tobacco.**—*Science*. N.S. XXXVI, No. 938, Dec. 30, 1912, pp. 875-876.

The Mosaic Disease of tobacco has generally been regarded as of physiological origin, but new facts have come to light which tend to modify this opinion, in that insects appear to be involved. No difficulty has been found in transferring the disease by inoculation to plants of the following genera:—*Nicotiana*, *Lycopersicon*, *Petunia*, *Physalis*, *Datura*, *Hyoscyamus*, *Solanum* and *Capsicum*. There is also evidence that the disease sometimes occurs in strictly wild plants. Attempts to inoculate the common potato, the egg-plant and belladonna failed, and two species of *Nicotiana*, *N. glauca* and *N. viscosa*, resisted inoculation.

The author's experiments tend to show that the conclusion from early investigations, that a true infectious mosaic can be produced in plants by simply cutting them back, is incorrect. Healthy plants were constantly cut back, sometimes for long periods, without producing any symptoms of true mosaic; but this was not accomplished until thorough methods of sterilising were observed, and the plants had been carefully screened and fumigated to exclude aphids.

The author is of opinion that mosaic in young plants is in no way connected with soil infection. He observed, however, that there appears to be a relation between the disease and aphid infestation. Healthy tobacco plants were always obtained if grown in screened cages fumigated at short intervals, but when aphids were introduced into cages containing healthy plants, wholesale mosaic infection took place. The matter is still under investigation.

KEILIN (D.). **Structure du pharynx en fonction du régime chez les larves de Diptères cyclorhaphes.** [On the structure of the pharynx in relation to the food of the larvae of cyclorrhaphous Diptera.]—*C.R. Acad. Sci.* No. 26. 23rd Dec. 1912. p. 1550.

The author enumerates the food of a number of genera of Diptera and says that, as a result of this enumeration, it follows that all the larvae of the cyclorrhaphous Diptera which are parasites of the most various kinds of animals or of plants, as well as carnivorous larvae, and larvae which suck the blood of mammals, never possess ridges in the pharynx, whereas on the other hand these ridges are always to be found in saprophagous larvae.

In one and the same genus female larvae may be found with or without ridges, according to their mode of life. A knowledge of these facts greatly assists the biological study of larvae, enabling us to classify decisively according to the food, and not merely according to the material in which the larvae may happen to be found. This is illustrated by several instances.

The examination of the last cast larval skin, enables the structure of the pharynx to be studied and the biology of those forms of which the pupa only is known can be reconstructed. Lastly by the presence or absence of ridges in the pharynx there is no difficulty in separating the true parasites of plants, of animals, and especially of man, from those which penetrate into the organism as the consequence of some local malady following upon bacterial infection, and behaving as saprophagi feeding upon material previously modified by these microbes.

**El gusano de la caña en Costa Rica.** [The Sugar-Cane Bug in Costa Rica.]—*Bol. de Fomento, San José, Costa Rica.* No. 7. 1912. pp. 466-469.

This scale-insect (*Pseudococcus sacchari*) is reported as spreading rapidly in the country and active measures against it are being organised. Specimens were sent to Washington and identified by Mr. T. E. Holloway, of New Orleans, who in his report says that Johnson grass (*Sorghum halepense*) and practically all the sugar-yielding Sorghums are attractive to these insects and should be kept down in and around the sugar plantations. The pest is largely spread by carelessness in the transport of cut cane. The principal natural enemy of the *Pseudococcus* is a Coccinellid beetle, *Crytolaemus montrouzieri*, which lays its eggs in the woolly masses of the Coccid, and these are consumed by the larvae as soon as they emerge. These beetles flourish in the gardens at Audubon Park, New Orleans, but cannot resist the cold winter. A small number of them was supplied to the Costa Rica authorities, from the Horticultural Department of California, and it is hoped that as the climate of Costa Rica is warmer than that of the United States, the insects will become acclimatised and multiply.

Another useful Coccinellid enemy of the *Pseudococcus* is *Scymnus intrusus*, a beetle much smaller than *Cryptolaemus*.

There is also a species of *Aspergillus* which in damp weather grows on the *Pseudococcus* and destroys it. Whale-oil soap emulsion is useful in keeping down the pest, but the burning of all cane waste is especially recommended as thereby other pests, notably the Cane Borer, are destroyed.

**Corn Worm, also known as the Grain Weevil.**—*Queensland Agric. Jl.* Nov., 1912, p. 383.

It is recommended that before grain is put away in tanks or other places it should be perfectly dry. Bisulphide of carbon at 1s. per lb. and naphthalin at 9*d*. per lb. are the principal substances used for keeping weevil and moth from grain.

The following method of using bisulphide is recommended:—

The dose for each 400 gal. tank is 4 oz. A suitable bottle of this or somewhat larger capacity is taken, a hole is made in the cork, a strong cord passed through the hole and knotted or otherwise secured on the under side; the cord should be about 5 feet long. Next a piece of wood with a hole in it large enough to allow the neck only of the bottle to pass and to rest upon the shoulder, and long enough to obtain a good grip on the grain when piled upon it, is slipped over the neck, the bisulphide is poured into the bottle and the cork and the hole in it made thoroughly airtight with putty. The bottle thus fitted is put at the bottom of the tank and the grain filled in. When full the cork is pulled out by means of the cord, the lid of the tank being then put on quickly and made tight everywhere with putty.

Another method is to take a length of stout bamboo perforated with gimlet holes at intervals. These holes are to be covered over with pieces of sacking or other material to prevent the grain blocking them. The bamboo is then set vertically in the tank and the grain filled in. A stick or rod which will pass down the bamboo is then taken, a plug of cotton waste being fitted to one end, the bisulphide is poured into the bamboo, the rod and plug quickly inserted and plugged at the top with cotton waste, the cover of the tank put on and made tight as before. Naphthalin may be used in the same way; 4 oz. dropped into the bamboo tube followed by a plug of waste, then another 4 oz. and a plug and so on till the bamboo is full: it is then set up vertically in the tank which is closed as before.

A similar plan may be adopted for heaps of maize or other grain. For large heaps, similarly charged bamboos should be laid horizontally, one for every 18 in. of depth. A hole in the bamboo at every foot will in this case be sufficient.

Of the two processes, naphthalin may be roughly termed a preventive, and bisulphide a cure, as it is a sure means of destroying any weevil or moth present. The tanks should be opened up periodically and the grain well stirred to retain vitality. The germinating power of the seed should be tested at intervals.

Some 10 years ago an American farmer discovered accidentally that salt prevented the attack of weevil. He sacked a quantity of cow-peas and one-fourth of the sacks used were salt-sacks with

the salt still clinging to them. When marketed he found those in the salt-sacks were in perfect condition, those in the others being almost destroyed by weevil.

It has been suggested that maize might be stored in husk, but it is the husk in which a great many weevils secrete themselves and afterwards destroy quantities of the grain. The same farmer knowing this, dissolved a quart of salt in 2 gallons of water and as the unhusked cobs were thrown into the barn he gave each layer a slight sprinkling of this salt solution. There was no weevil damage, and he has, he says, used this simple remedy ever since with perfect success.

Mayné (R.), Entomologist to the Belgian Congo. **A serious pest of** *Coffea arabica: Bixadus sierricola,* **Wh.**—*Bull. Agric. Congo Belge.* III, No. 4, Dec. 1912, pp. 911-917.

Before the taking over by the State of the station of Lemba (Lower Congo) which has now been transformed into an experimental garden, a variety of *Coffea arabica*, obtained originally from San Thomé, was cultivated there. The trees were attacked by *Bixadus sierricola*, White, which was one of the principal causes of a serious reduction in the yield of coffee.

This Longicorn is already known as a coffee pest in W. Africa and Von Faber has compared its ravages with those of *Moecha adusta*, a Longicorn pest of cacao; the writer finds, however, no resemblance in the damage caused by the two insects. The coffee pest confines its attack to the part of the trunk just above ground. The cacao pest bores a long burrow in the main trunk and larger branches. Morstatt has described similar damage done by an allied species, *Anthores leuconotus*, Pasc. (*Herpetophygas fasciatus*, Fähr.) to coffee trees in the Moschi district of Usambara.

Reproduction in the case of *Bixadus* is annual. The first adults are to be seen during October, at the beginning of the rainy season, and the last hatch out in December. They are to be found on the coffee trees in the morning and occasionally on other trees near by. Eggs are laid about the end of September and possibly as late as the end of December. The writer has been unable thus far to fix the duration of the egg stage or the precise date of hatching; but he found larvae in a few trees late in March. The larvae go on burrowing up to August and September, when pupation takes place. A number of observations has established the duration of the pupa stage at 30-45 days. The insects are to be met with from October to January.

The place of oviposition is generally 15-20 cm. (6″-8″) above ground, in a fold of the bark at the point of intersection of a secondary branch or in a cicatrised wound. Young trees (3 years) are rarely attacked; trees of 4-5 years or old trees are generally selected and suffer most. There is no preference shown for feeble trees. The larval stage, during which *Bixadus* does the real damage, may be divided into 3 distinct periods:—(1) The young larva gnaws the bark and the cambium layer; (2) the

larva penetrates into the root: (3) the larva returns to the earth level and remains in the woody and cambium zones, but especially in the former.

In stage (1) the burrows are flat, somewhat sinuous and descending, destroying the cambium layer and the bark, occasionally reaching the exterior. When the ground-level is reached the larva begins to attack the wood, blocking the burrow behind it as it goes with "frass" to protect itself against its most dangerous enemies—the ants.

The greatest damage is done in stage (2) in the root, the burrow generally cutting the intersection of the first secondary root with the primary. The larva then burrows wide galleries in the wood, but generally returns to the surface, destroying the bark and part of the wood 5 or 6 cm. (2"-2½") above ground. White ants and fungi complete the work and the root is soon detached entirely, the tree being weakened and its hold on the ground imperilled. The tree makes vigorous efforts at repair, but the further attacks of *Bixadus*, white ants, the larvae of Elaterids and other Coleoptera complete the destruction.

The aspect of an attacked tree is characteristic. It leans over owing to the root damage; suckers are thrown off from the principal inclined branch, but these are rarely productive. In a few years the tree dies, having lost practically all its roots.

After completing its sojourn in the root the larva mounts to the wood above and burrows large galleries, some upwards, some downwards, but quite irregularly. Arrived near the surface, it excavates a large cavity in which to pupate. The holes through which the insect emerges are large and plainly visible.

*Methods of destruction.*—Capture of the insects can only be regarded as supplementary to other measures. Destruction of the larvae is difficult and hardly practicable, especially in the third stage. The best plan seems to be to seek the larvae in the bark about March. If a plantation be well watched the attack can often be detected by the presence of corky lumps on the bark or by "frass" on the ground beneath the tree; the larvae may then be tracked under the bark.

Carbon bisulphide injected into the burrows has been tried, but the "frass" plugging prevents its taking effect. The best plan appears to be to bore a hole with a brace and bit across the possible line of the burrows, introduce a wad soaked in bisulphide and then close the hole quickly with a plug of clay, painting the outside over with tar. Mixtures of petroleum and bisulphide have given the best results and 4-5ths of the trees attacked have been cleared of these insects by the free use of this mixture. The best time to operate is September.

Preventive measures are the most to be recommended and chiefly the protection of the tree from a fresh deposit of eggs of *Bixadus*. The insects leave the pupal chamber by a hole which is just below ground; the roots must therefore be exposed sufficiently to uncover this hole; this part of the trunk is then lightly scraped to 40 cm. (16") up and coated with coal tar. This should be done in the latter half of September and at the same time all old bore-holes should be plugged with clay. In

order to help attacked trees to resist the wind, they should be earthed up. Another method recommended by Banks against a Longicorn beetle (species as yet undetermined) popularly known as the "flat-head borer" consists in painting the tree with the following mixture instead of tar: soft soap 4 parts, hot water 4 parts, carbolic acid ½ part, all by volume; let the mixture rest for 24 hours and add 32-40 parts rain water, then stir well till mixture is complete.

In large and badly infested plantations the most practical method is to destroy the whole by fire and not cultivate coffee on the same land for some years.

[Fortunately the author has figured the species to which he refers, and it is possible to say definitely that it is not *Bixadus sierricola*, White. So far as can be judged from the figure, the species is almost certainly an *Anthores*, and probably the common East African coffee-borer, *A. leuconotus*, Pasc.—Ed.]

Patch (Edith M.). **Elm-leaf Curl and Woolly Aphid.**—*Maine Agric. Expt. Sta., Orono*, Bulletin 203, 1st Nov. 1912, pp. 236-258, 3 plates.

Certain aphides are now known to appear under two forms, *e.g.*, *Chermes abieticolens*, Thomas, of the red spruce is conspecific with *C. pinifoliae*, Fitch, of the young white pine, etc.; and these alternations of food plants point to possible means of control.

The author found it impossible to separate, on structural characters, collections of *Schizoneura americana* (causing elm-leaf curl) from *S. lanigera* (the woolly aphid of the apple). In some cases the antennal differences were great and in others the only distinction was the tree from which the specimens were taken. A study of the antennal variations in nearly 1,000 individuals is in the press.

Leaf curl from elm, with pupae and alate forms, were obtained from the south and the winged insects were caged over clean seedling apples; unmistakable woolly aphids of the apple resulted. In some cases the nymphs died, the particular seedlings being presumably aphid resistant.

The common forms on the roots and stems of apple trees are wingless and not more that 1-10th inch in length, of a reddish brown colour and abundantly covered, especially those above ground, with a flocculent waxy secretion.

In autumn winged females appear in abundance, being small, clear-winged insects, almost black, with the body more or less covered with cottony secretion. These are the autumn or return migrants that seek the elm bark to give birth to the generation of true sexes minute wingless, beakless creatures, the female of which deposits a single "winter egg" within a crevice of the elm bark. On the elm, the stem mother, which hatches from the over-wintering eggs, appears in the early spring and may be found in Maine, before the middle of May, stationed on the partly opened leaf buds. By the end of the month the earliest of these wingless stem mothers are mature and found in the leaf curl or in the

"rosette" (terminal leaf curl when a group of terminal leaves is affected) which they cause; the next generation is also wingless. In the summer great numbers of wingless individuals are produced. The migration from the elm leaves of these summer migrants is either partly to apple and partly to elm bark, or elm bark colonies as well as leaf curl may be established by the first or second apterous generations. This does not account for the generations resulting from the over-wintering forms on the apple roots and their sequence remains to be studied. The autumn migration of the woolly aphis from apple and the mountain ash has been observed by the author, but she has not been able to link it with the true sexes on the elm. That inference, however, from the evidence of the spring migration to apple, the author regards as unmistakable.

Migration from elm leaf to apple and mountain ash, under normal out-door conditions, was established in the summer of 1912. *Pyrus americana* and introduced species of mountain ash are favourite summer hosts in Maine. The author effected the migration to mountain ash artificially, the aphides bred and thrived quite normally. The sequence of generations is as follows: *Egg:* 0·5 mm. long, gamboge-yellow inclining to brown; in crevices under elm bark. *Stem mother:* purplish red when mature, about 3·5 mm. in length. *Second generation:* apterous viviparous forms, never so large as the stem mother, inhabiting leaf curl and giving birth to migrants. *Third generation:* winged viviparous females, variable in size; these develop within and migrate from elm-leaf curl to apple, producing young which live on apple. *Fourth generation:* differs from the preceding in the "pro-muscis" being much longer; antennae have 6 joints and no annulated constrictions; colour orange; deposited on apple by the spring migrants and develop there in flocculent masses; individuals move to other parts of the tree and establish new colonies. *Fifth generation:* second apterous generation on apple bark; practically the same as the fourth. *Sixth (?) generation:* the woolly colonies on apple, mountain ash and *Crataegus* migrate to elm bark to deposit their progeny, the true sexes. Together with these, in the same woolly colonies, develop apterous viviparous females that give birth to nymphs which seek the roots of trees and hibernate there, surviving the winter it conditions are favourable. *True sexual individuals:* this generation seems to have no object in life beyond the deposition of eggs since they can neither eat nor fly.

The danger from the woolly aphis is greatest to nursery stock and to young orchards. From 20 to 40 million seedling apples are raised in the United States every year and 20 per cent. to 25 per cent. of these become infested. The insect has also become a serious pest of the white elm (*Ulmus americana*), now largely grown as a shade tree.

*Preventive and remedial measures.* The knowledge that the aphis of elm-leaf curl is identical with that of the apple points to the removal of nurseries from the neighbourhood of elms as a good preventive measure, and where apples are grown, elms should not be planted as shade trees.

The usual tobacco and other washes, especially if applied warm, are effective against the aphis when accessible, but care should be taken that they are used in sufficient quantity and applied with sufficient force to penetrate the woolly covering. The root-feeders are more difficult of access; strong soap or tobacco washes applied to the soil above the crown; soot, ashes and tobacco dust, lime and gas lime buried about the roots are remedies in use. Badly infested nursery stock should be destroyed.

*Insect enemies of the woolly aphis.* In the elm-leaf curl, at least in Maine, the woolly aphis is vigorously attacked by a predaceous Capsid bug (*Camptobrochus nitens*), by the larvae of a Coccinellid and by *Syrphus* maggots; in other parts of the country the aphis is preyed upon while in the elm-leaf to such an extent that consignments sent to the author often yielded more enemies than pests.

The list of enemies of the woolly aphis recorded by Riley (1879) and Marlatt (1897) is quoted, including Coccinellid beetles, Capsid bugs, Syrphid flies, and a Lepidopterous larva, *Enarmonia (Semasia) prunivora*, Walsh.

Lacewing flies are very destructive to *Schizoneura lanigera* in Colorado, where Mr. Taylor concluded that they did more than all else to subdue the unusually severe outbreak of woolly aphis in Grand Valley in the early summer of 1907. The Capsid, *Camptobrochus nebulosus*, Uhl., commonly feeds upon it in Colorado. The bulletin concludes with a list of food plants, synonymy and literature.

*The Cyprus Journal*, No. 27, Oct. 1912, p. 655.

Early in January the Government received a consignment of a material called "Corvusiene" which it is claimed will clean seeds from insects; it is also said to be a remedy against "sirividhi," and to protect seed against birds. One hundred grains of corn treated and the same number not treated with Corvusiene were exposed on a house roof; the treated grain remained untouched after 2 months. The overseer of the Experimental Garden, reporting on experiments with this material at Kaimakli, says that in addition to keeping off the birds the preparation protects the grain from insect attack. It is claimed that it is very effective against some forms of smut and rust.

NEMERY (—). **Bee Culture in the Kasai.**—*Bulletin Agricole du Congo Belge*, III, No. 4, Dec., 1912, pp. 934-937.

Bees are widely distributed in the district. They are generally to be found in the hollows of trees. The natives collect the honey and wax by first cutting down the tree in which the nest is found, they then smoke the insects, carrying on their operation without the slightest care and without seeking to separate the products. They pay little or no attention to bee culture.

Swarming takes place in the months of September and October, that is at the commencement of the rains. One colony may yield as many as 4 swarms in a season, but they are then small and do

not weigh more than about 2 lb. The swarms travel for a long time, sometimes several days, before finding a settling place which suits them. This is possibly due to the smallness of the shelters which the bees occupy and which they abandon one after the other until they find a resting place of sufficient size. Travelling swarms are sometimes so numerous that on some days several may be seen to pass the same spot. On one occasion 7 were so observed. Attempts at apiculture have been made at Bena Bibele with some success though for a time the native bees could not be reconciled to the type of hive used, "Dadant Blatt" and "Layens."

They have to be tempted with sugar to enter the hives, the openings of which should be towards the west, not to the south. The sun's rays should not be allowed at any time to strike the walls of the hives, otherwise the heat is more than sufficient to melt the wax and break down the comb. Although the Congo bees are very active, they do not leave the hive during the heat of the day, *i.e.*, between 11 in the morning and 3 in the afternoon. They have many enemies, and of these the white ants are very formidable. It is possible to keep them away from the hives by covering the legs of the tables on which they stand with cloths dipped in cresylatine, the odour of which appears to be exceedingly repugnant to termites. A broad circle of ashes spread round the hives seems also to prevent attack.

Another enemy is a species of wasp which catches the bees on the wing at the entrance to the hives and carries them off to its nest. Sometimes these insects are to be seen in great numbers on the table in front of the hive. The best way of getting rid of them is to kill them *in sitú* with a switch.

ARBULOT (— ), dealing with bee culture in the Upper Kasai, says:—

Bee culture is widely spread throughout the Upper Kasai. From Katola to Dilolo and all around these places, as well as along the frontiers of Angola, the natives practice bee culture, but apparently do not regard it as of much consequence. The native hive is made from the wood of a tree of large diameter. They take sections of a trunk, 1-1½ metres long, removing the bark in the form of a cylinder and fitting the interior with wooden supports for the combs. The two extremities are closed, with an aperture for the bees in the centre of each. These hives are generally hung in trees at a height of 3 to 5 metres. Swarming takes place twice a year, the first in May and June and the second in September and October. A species of wasp very common in the district is a great enemy of the bees. There are also two animals in this part of the Colony which pillage the hives. They are called by the natives *Tchimbulu* and *Katcha* respectively. The former is as big as a large wild cat and has black fur; the latter is a dark red, spotted with black. They are very difficult to capture even with traps.

The natives are very fond of honey and use it as a medium of exchange. They make a fermented drink from it and frequently mix it with their food. The wax is marketed by them in

Portuguese territory at Kafungo, Mahico, and near Lake Dilolo. It is sold in blocks of 5 kilos at 2 fcs. a kilo. The trade has been stopped on account of the very great rise in the cost of transport which has recently taken place.

DE CHARMOY (D. d'E.). **Report on *Phytalus smithi*, Arrow, and other Beetles Injurious to the Sugar Cane in Mauritius.**—Port Louis Govt. Printing Office. 1912. pp. 1-35. 8 plates and 1 map.

In July 1911, several beetles were received from a sugar estate in the north of the Island and reported as doing much damage. On 28th July the estate was visited and it was decided to take official action to limit the ravages of the pest.

Plantations of young canes 4 months old had been utterly destroyed and beans, "Pois sabre" (*Canavalia ensiformis*), growing between the furrows had completely disappeared. In older canes (rattoons) the roots were being rapidly destroyed. The insects were found on two estates only, and between 26th Dec. 1911 and the end of April 1912, 1,165 had been collected on one of these estates. Enquiries made in Natal, Cape Colony and Ceylon showed that the pest was unknown in any of these Colonies, and Mr. G. J. Arrow, of the British Museum, pronounced it to be a new species, which he has described under the name of *Phytalus smithi* (MELOLONTHIDAE).

The insect is known in Barbados, where it damages cane roots to a small extent; Mr. Arrow being of opinion that a parasite keeps it in check. It may have been introduced into Mauritius with a cargo of mules from South America.* It is also possible that it has come over from Barbados with samples of rooted canes. The first recorded specimen was captured four years previous to this outbreak. The means adopted for destruction were, ploughing, with men following and picking up the grubs; and where the plough could not be used the ground was hoed, but the cost was more than double and the result by no means so satisfactory. After harvest, all fields of 3rd and 4th rattoons were cleaned and the stumps removed; the larvae were found almost entirely on or near the roots. The 1st and 2nd rattoons were dealt with by laying bare the roots and picking off the larvae; when the owners objected to this method as likely to destroy the canes, petroleum emulsion, containing 1 per cent. creoline or carbolic acid, was used at the rate of about 10 litres ($7\frac{1}{2}$ quarts) per stump. The results of these operations were satisfactory, and by the end of October 1911 over a million and a half of insects had been destroyed and it was hoped that the pest had been subdued. On 4th September the capture of adults after dark was begun. Fires proved useless, so gangs of men with lanterns were employed; at first this plan was not very successful, 10 men capturing only 166, on coffee plants, in a fortnight, but

* [There is not at present any valid evidence for this suggestion, as the species has not yet been authentically recorded from any locality other than Barbados and Mauritius.—Ed.]

as the insects increased, 376 were taken on one estate, 76 on another, and 980 on a third in 50 days; by 4th October, 58,991 had been taken. The men were at first paid 40 cents of a rupee per hundred, but in December, when the insects literally swarmed, this was reduced to 5 cents; by March the price was raised to 50 cents. Altogether from August 1911 to April 1912, no less than 27,520,471 were taken at a cost of Rs. 71,575 by the various methods employed. Special attention was paid to the collection on the borders of the infested areas so as to prevent spread to neighbouring plantations, on which the presence of a few insects might have been neglected and thus given rise to fresh foci.

The method of cultivation of the cane in Mauritius prevented the use of insecticides, as these, to be efficacious, must be mixed intimately with the soil. Paris Green and "Vaporite" proved useless, and potassium cyanide was only effective when it came into actual contact with the larvae. Injection of the soil was far too costly (Rs. 350 per acre). "Durandine" and petroleum emulsion, consisting of a 1 per cent. solution of the former and a 7 per cent. solution of the latter, gave very good results, but the cost is prohibitive. "Sulphides" were tried and proved ineffective. Petroleum and creolin emulsion gave the best results, from the point of view of both efficiency and cheapness. It is prepared thus:—500 grams of common soap dissolved in 9 litres of boiling water; add slowly 18 litres petroleum and stir till the liquid is quite viscid; to 800 cc. of the emulsion add 200 cc. creolin, or to 700 cc. add 300 cc. phenyl; to either of these mixtures add 100 times their volume of water. Ten litres to each cane hole is sufficient. Carbon bisulphide could not be used, as none could be obtained locally, and the cost would probably be prohibitive.

During the day the beetle lies buried in the ground at a depth of 5-8 in. Soon after dark it emerges, flies to the nearest bush or hedge, and starts nibbling the leaves in regular arcs; before dawn it again retires underground. The hemispherical notches in the leaves are quite characteristic and give a certain clue to the presence of the insects. The adult does little damage; anything green seems acceptable but there is a marked partiality for the leaves of *Cordia interrupta* and the hunters soon found that branches of this shrub stuck in the ground helped them greatly to increase their catch. Light does not attract the beetles and a *powerful beam only renders them motionless; shaking the plant* causes them to drop off at once. They are rarely seen on the wing and never fly far; so that, despite the prolificity of the insect, it has not spread very far. Adults are apparently met with all the year round. For the nine months from Sept. 1911 to April 1912 the captures (in thousands) were respectively 81, 1,250, 5,655, 17,492, 1,052, 469, 125, and 185. *A captured female took four months to deposit 46 eggs, and it appears that* the first batch laid is rarely less than 15, so that the total number of eggs seems to be about 60. They are never laid in clusters, but individually at a depth of 4-6 ins. below the surface. The laying of eggs appears to go on practically all the year round. The incubation period is 15-18 days, but in December may be as

short as 7 days; the incubation period of eggs laid on the same day by the same female under identical conditions sometimes varied as much as 48 hours.

The larva so closely resembles other Lamellicorn larvae that knowledge is required in order to distinguish it from the larva of *Adoretus* (RUTELIDAE) for example. The duration of this stage has not yet been determined, but it is estimated at 6-8 months. The larvae begin to be torpid in October, gradually stop feeding and penetrate deeper into the soil, where they enclose themselves in a cell of agglutinated earth 20 mm. long, rough externally but smooth internally. Within this cell the larva passes through the pre-nymphal stage and after 6-8 weeks is transformed into a pupa from which the imago will emerge 18-25 days later.

The larva moves but little from the place in which the egg from which it emerged was deposited and only changes its feeding ground under necessity. It devours the roots of beans and manioc exactly as it does the roots of sugar cane and will attack other plants, though it exhibits a marked partiality for sugar cane. A rich, humid, loamy soil suits it best; on dry or rocky ground at a higher level it was far less abundant. It is calculated that 14,400,637 females were killed in the campaign; assuming an average of 50 eggs per female, 720 million potential pests were destroyed.

Mr. Arrow has discovered on larvae received from Barbados a parasite which he believes is a larva of a *Scolia*,* so that reasonable grounds exist for assuming that this parasite might prove a valuable auxiliary in combating the pest.

A local fungus disease attacking *Phytalus* has been discovered and is under experiment, and samples of the Hawaiian beetle-fungus have been received with the hope of infecting *Phytalus smithi*.

### *Other Beetles Living at Roots of Sugar Cane in Mauritius.*

*Adoretus versutus* (RUTELIDAE).—A common pest, attacking all trees, cultivated or wild: found at night in great numbers all the year round, except July-September. Ornamental plants and fruit trees are completely defoliated. It has been noticed however that the imago does not feed on lemon and orange trees, sugar cane, sorghum, &c. In the larval stage it is injurious to all plants and causes great damage. Though found throughout the year, it literally swarms from October to May. The beetle flies at night, burying itself in the ground by day. The best remedy is to catch the beetles by lanterns after sunset and throw them into water. The trees should not be shaken as the beetles fly instantly or drop to the ground.

*Adoretus compressus* is smaller and less common, and not such a serious pest.

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* [Mr John R. Bovell, Superintendent of Agriculture, Barbados, has sent home specimens of this parasite, which he has bred: it proves to be *Tiphia parallela*, Smith, a species which occurs also in Central and South America.—Ed.]

*Serica* sp. nov. (MELOLONTHIDAE) is found in great numbers in November in harvested cane fields, but it has not been possible to ascertain the extent of the damage done.

*Oryctes tarandus*, Ol. (DYNASTIDAE).—One of the largest of the beetles of Mauritius. Three species of *Oryctes* are known in Mauritius under the vernacular name of *moutones*. They were not regarded as very destructive of the sugar cane, even in damp localities where they sometimes entirely destroy old stumps. The real damage done by the *moutones* was not suspected until the scare caused by *Phytalus* took place, when in August 1911 on one estate 122 acres were uprooted and 311,000 *Oryctes* larvae were found. The practice of burying cane trash to enrich the soil between the rows is probably largely responsible for the increase of *Oryctes*. They are attacked by the fungus which also infests *P. smithi*. *Gymnogaster buphthalma*, Blanch. (MELOLONTHIDAE) very closely resembles *P. smithi* and has been collected in great numbers at cane roots, destroying the stumps in the same manner. *Agrypnus fuscipes*, F. (ELATERIDAE) is found in small numbers on cane roots; the nature and extent of damage done has not been ascertained. *Eutochia fullo*, Eric. (TENEBRIONIDAE): very common in the cane fields; the larvae injure cane cuttings by destroying the eyes; they also attack maize seeds in the ground. *Opatrum crenatum* (TENEBRIONIDAE): even commoner than the previous species and with the same habits. *Cratopus punctum*, F. (CURCULIONIDAE): very common; attacks the tender leaves of all kinds of plants, sometimes defoliating them completely. *Trochorhopalus strangulatus*, Gyl. (CURCULIONIDAE): not uncommon in young virgin canes, when old uprooted stumps have been buried or left in the interlines; often attacks cuttings and even the stalks.

*Other Insects attacking Sugar Cane in Mauritius.*

Lepidoptera.—SATYRIDAE: *Melanitis leda*, L. NOCTUIDAE: *Cirphis (Leucania) unipuncta*, Haw.; *C. loreyi*, Dup.; *Sesamia vuteria*, Stoll (*nonagrioides*, Lef.): *Spodoptera mauritia*, Boisd. PYRALIDAE: *Diatraea striatalis*, Sn. TORTRICIDAE: *Grapholita schistaceana*, Sn. TINEIDAE: *Aucita sacchari*, Boyer.

Hemiptera. APHIDIDAE: *Aphis sacchari*, Zehnt.; *Tetraneura lucifuga*, Zehnt. ALEURODIDAE: *Aleurodes bergi*, Sign. COCCIDAE: *Dactylopius calceolariae*, Mask.; *Sphaerococcus bambusae*, Mask.; *Chionaspis tegalensis*, Zehnt.

THEOBALD (F. V.). **The Aphididae of the Hastings District.**—*Hastings & E. Sussex Nat.* ii, part 1, 31st Dec. 1912, pp. 9-20.

The author gives a list of 69 species of APHIDIDAE found in and near Hastings. He recommends that specimens should be kept in glass tubes containing a 4 per cent. solution of formalin, after previous soaking for fifteen minutes in 60 per cent. alcohol.

**Vers-à-soie sauvages d'Afrique** [Indigenous African Silkworms].—*Quinzaine Coloniale*, 25th Jan. 1913, p. 59.

Recent researches in Uganda have resulted in the determination of three species of indigenous silkworms *Anaphe infracta*, Wlsm., *Hypsoides milleti*, de Juan, and *Mimopacha gerstaeckeri*, Dew. The first-named is the most widely distributed and produces the largest quantity of silk; the imago appears in January and September. The food-plants of the caterpillar are *Bridelia micrantha*, *Cynometra alexandri* and *Triumfetta macrophylla*. The nests of *Anaphe* vary greatly in size, as does also the number of cocoons contained in them. They weigh from 3 to 4 kilos and contain 130-500 pupae; 25 nests will yield about 1 kilo of crude silk. The chief enemies of *Anaphe* are certain birds, which eat the young larvae before their stinging hairs are developed, and also various parasites which attack them at all stages of development.

FISKE (W. F.). **The Gipsy Moth as a Forest Insect, with suggestions as to its control.**—*U.S. Dept. Agric., Bur. Entom., Circ.* 164, 17th Jan. 1913, pp. 1-20.

In the earlier invasions of the Gipsy Moth it was regarded as absolutely omnivorous, though possibly from necessity. It is now no longer prominent as a field and garden pest and the American Tent Caterpillar frequently surpasses it in damage to orchards. Forests have suffered less than was originally expected and generally the situation has improved within recent years.

*Causes of the improvement.*—The Gipsy Moth is at present most active in a belt of towns beyond the limits of the densely populated metropolitan area, and it is possible that even great destruction in out-of-the-way places has not attracted so much attention as the earlier damage done in the parks of the large towns. But real improvement was noticeable in the metropolitan district and this is probably due to at least four main causes:—(1) the perfection and standardisation of methods for artificial repression; (2) the death of a large proportion of the more susceptible trees or their removal from the infested woodland; (3) the importation of parasitic and predatory insect enemies; (4) the development of the "wilt" disease.

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Artificial methods for repression cannot be used in forests, because of their expense. About 30 species of insect enemies of the moth are of importance in checking its increase in Europe and Japan. All the more promising of these species have been imported, and more or less successfully established in America. About one-third of these may be regarded as fully established and as steadily increasing in efficiency. Within an area a little to the north of Boston quite 50 per cent. of the eggs, caterpillars or pupae of the Gipsy Moth in the aggregate were destroyed by imported parasites in 1912. The parasites have not spread over a large area, but are extending every year, and may be increased by artificially assisting the dispersion of certain species.

The principal cause of improvement is the "wilt" disease of the larva, probably due to a bacterium described as *Gynococcus flaccidifex* by its discoverers Messrs. Glaser and Chapman; but this requires confirmation. The disease first appeared between 1903-4 in certain of the worst infested forests, and by 1907 it had spread throughout the whole infested area, reaching a climax about 1911. How the caterpillars originally became infected is not known, but it is believed that the organism is conveyed from one generation to another through the eggs. Simple infection is not sufficient to cause death, but an infected caterpillar can, it is believed, transmit the disease directly to its offspring. A weakening of the caterpillar from some other cause appears to be necessary to produce a fatal result, the contents of the body being resolved into a black liquid and this, fouling the foliage, transmits the poison to other caterpillars. Unfavourable food appears to be directly contributory to the death of the caterpillar, for whereas it used to be easy to rear caterpillars in the laboratory upon lettuce, for example, when they were free from the taint of the disease, it is practically impossible to do so to-day if American eggs are used. If foreign eggs are used from a locality where "wilt" is not prevalent this is not the case. Lettuce is no exception: practically all herbaceous plants and a considerable variety of trees and shrubs appear not to be really suitable foods, at all events for the infected caterpillar.

*Artificial utilisation of the "wilt" disease.*—The fact that seriously infected caterpillars, provided the food be suitable, will pass through all their stages, throws some doubt upon the utility of spreading the infection by artificial means. Elaborate field experiments with disease-infected food-plants have practically failed; that is to say, it made no difference whether the caterpillars were fed with infected food or not; large numbers died in both cases and no noticeable difference was found between the mortality in the experiments and in the checks. There is also a very great difficulty in securing uninfected caterpillars for experiments. The author is strongly of opinion that results claimed by recent experimenters are misleading for these reasons.

*Natural control of the Gipsy Moth abroad.*—Mr. Fiske, after personal investigations in Europe, finds that the invasion of some 3 to 7 years ago has spent its force and that in Italy and Germany, at all events, the moth cannot really be described

as abundant. Evidence was discovered of the existence there of an epidemic disorder similar, externally at all events, to the American "wilt" and also resembling the disease of the Nun Moth (wipfelkrankheit). It was also clear that the enormous decrease in numbers caused by this epidemic was not followed by an unusual increase of the remainder, such as has so frequently been observed in America, but rather that a more or less innocuous minimum was reached and maintained for an indefinite or at least protracted period; presumably the result of the operations of parasites.

Serious outbreaks in Sicily and in Calabria extending over a number of years presented the peculiarity that although the number of caterpillars was enormous, in no case was the entire forest defoliated at once, but only after the second or third year. Parasites were abundant, destroying approximately 90 per cent., which was far from sufficient to prevent increase, and the millions of caterpillars which died of starvation and exposure dried up without showing any trace of the decomposition invariably associated with the "wilt." As a result, in the worst infected portions of the forest there were very few eggs, but the caterpillars would always be remarkably healthy the next season, and as the parasites were attracted to the more badly infested parts of the forest, the rate of increase elsewhere was simply astounding. In no locality other than these two, either in Europe or America, has the author been able to find Gipsy Moth unaccompanied by disease, and it is the prevalence of such extraordinary conditions and their similarity to those which prevailed in America before the development of the disease, which convinced him that the present improved conditions are largely due to the prevalence of the "wilt" disease.

The author is of opinion that the methods of forest management in Europe are largely responsible for checking the ravages of the pest, although it is possible that these are the result of long practical experience rather than of scientific observation, and he strongly urges the elimination of those trees most likely to be injured. As a matter of fact their removal is taking place automatically in the United States, in the territories which have been longest infested, but the natural process is accompanied by the unnecessary destruction of other trees and avoidable pecuniary loss.

Observations made in the United States show that the trees may be roughly divided into three groups according to their susceptibility to injury. The first group most affected is composed entirely of the various species of oaks; in the second group are those trees which appear especially favourable to the increase of the moth immediately following its establishment; these are rarely completely stripped and very rarely killed by the moth. The birch and willow are the principal trees in this group. The third group consists of trees which may be called "resistant," for they may be thus described at least so long as the "wilt" remains as efficient as it is at present; they include pine, spruce, fir, junipers, cedars, poplars, chestnuts and many others.

Mixed forests are attacked somewhat in proportion to the presence of the favourite food-tree; that is to say, if, for example,

such trees are few, they will be completely defoliated and the caterpillars will then proceed to the nearest tree of whatever kind it may be. Undergrowth, if not of any favourite food-plant, is useful, because the caterpillars having devoured the leaves of a tree and having to pass through such undergrowth before reaching another of their favourite food-trees, almost of a necessity consume a large quantity of unsuitable food and consequently become more susceptible to the attack of the disease.

The author suggests that the natural remedy is to avoid the mixture of trees in forests. For example, in a pine wood with scattered oaks, the oaks should be cut down, in order that the pines, which are not attractive to the moth, may be entirely saved from attack. The whole question is now one for the practical forester rather than for the entomologist to settle.

**Black Witch or Tick Bird.**—*Agric. News, Barbados*, 4th Jan. 1913, p. 10.

This bird (*Crotophaga ani*) is an insect-eater found from South America to the southern United States and throughout the Antilles, with the exception of Montserrat, Antigua, and St. Kitts-Nevis in the British West Indies. Its occurrence in Dominica dates back only a very few years. Amongst its common names are: Ani, Black Parrot, Savannah Black Bird, Tick Bird, Black Witch, Keel Bill and (in St. Lucia) Merle corbeau. In Jamaica it has been noticed eating Stink Bugs (PENTATOMIDAE), Cotton Stainers (*Dysdercus*) and ticks, and it also devours useful insects such as ladybirds and wasps. The question of its introduction into the island of Antigua has been raised, but inasmuch as many instances are known where the introduction of a species of bird or animal into a new locality, has produced conditions other than those which were sought, the matter requires careful consideration. The bird might possibly destroy more useful insects than pests, and it also feeds on seeds and berries.

FULLAWAY (D. T.). **Gall-Fly Parasites from California.**—*Jl. N.Y. Entom. Soc.* xx, Dec. 1912, pp. 274-282.

The author describes nine new Chalcidid parasites of gall-flies which have been bred by Mrs. R. P. Blakeman at Stanford University.

They belong to the following genera:—*Syntomaspis*, Först., *Ormyrus*, Westw., *Eurytoma*, Ill., *Decatoma*, Spin., and *Tetrastichus*, Hal.

CHAMPION (G. C.). *Aegythopeus* (*Baridius*) *aterrimus*, **C. Waterh. in the orchid-house at Kew.**—*Entom. Mthly. Mag.* xxiv, Feb. 1913, p. 33.

A specimen of *Baridius aterrimus* has been found in the flower of a Venezuelan orchid, *Catasetum splendens*, at Kew Gardens. Mr. Jamie has described this insect as destroying *Phalaenopsis* and other orchids in Singapore. It has been found in conservatories at Torquay, Tunbridge Wells and Oxford.

Weiss (H. B.). **Notes on *Lixus concavus*.**—*Jl. Econ. Entom.* v, Dec. 1912, pp. 434-436.

This beetle, commonly known as the "Rhubarb Curculio," emerges from its winter quarters about the last week of May in the latitude of New Brunswick, N.Y. Eggs are laid soon after emergence and have been collected on the 1st June on the stems of dock, *Rumex crispus*, which is undoubtedly the favourite food-plant of the larvae. Oviposition ceases about the middle of June. The larva first enlarges the egg cavity and then cuts an irregular channel down the stem to the roots, where it remains and feeds till full-grown. The first larva hatched bores down the stem to the root, eating any eggs or larvae it comes across on its way. Those that hatch later seem to follow the course of the first and to be eaten by it when they reach the cavity in the root. The larvae attain maturity in 8 or 9 weeks; the majority pupate during the latter half of August and there are many adults about in the first week of September. The pupal period, in the laboratory, was found to be 10-12 days; and the pupal cells are on a level with the surface of the ground. The beetle on emergence feeds somewhat on young leaves at the base of the dock, but they are so scarce after the first week in September that they apparently go into winter quarters soon after emergence.

If *Rumex crispus* is cut several inches from the ground between the middle and end of July and rain then falls, a large percentage of the larvae die owing to the decay which sets in.

Wodsedalek (J. E.). **Life History and Habits of *Trogoderma tarsale* (Melsh.), a Museum Pest.**—*Ann. Entom. Soc. Amer.* (Columbus), v, Dec. 1912, pp. 367-381.

The author describes the larvae and pupae, and quotes cases of damage done to insect collections. In the U.S.A. this Dermestid beetle is distributed from coast to coast, being specially abundant in the Northern States, and when once introduced into a building is by no means easy to exterminate.

*T. tarsale* may be found in all stages of development throughout the year in well heated buildings. The author has obtained two generations and part of a third in a museum in one year. Pairing usually takes place the day after emergence from the pupa, and within 3-5 days later from 3 to 60 eggs are laid; the larvae hatch on an average in 12 days and do not wander far unless food is decidedly poor or scarce. It was constantly observed by the author that certain of the larvae refused to pupate, but continued to feed for over two years after attaining full growth; several have lived for more than 3½ years. Pupal period, 11-17 days; life of adult, 10-32 days. Dried insects and fish appear to afford the best food, but young larvae placed at once after hatching on a feather diet have lived more than two years; though at the end of that time they were only the size of well fed larvae 14 days old. They have been shown to be capable of living on red pepper, seeds and meals of all kinds, and it would appear that they are often attracted to grain by the dead weevils, eating

the grain when the supply of dead insects fails. It has been shown experimentally that the larvae will live a year or more without food.

Severin (H. H. P.) & Hartung (W. J.). **The Flight of Two Thousand Marked Male Mediterranean Fruit Flies** (*Ceratitis capitata*, **Wied.**).—*Ann. Entom. Soc. Amer.* (Columbus), v, Dec. 1912, pp. 400-410, 1 pl., 1 map.

The authors marked 2,000 male flies by cutting off a portion of one leg. They were kept in jars and fed on molasses until the wounds had healed, and were then set free on the outskirts of Honolulu, in Manoa Valley. This valley is 2 miles long, varies in width from one mile to half a mile and is walled in by mountains 2,000 to 2,500 feet high. At the head of the valley, in a circle about half a mile in diameter, 50 kerosene traps were wired among the branches of citrus, fig, guava and other trees. It was found on a previous trial that of every thousand Mediterranean fruit flies captured in kerosene traps only three were females and therefore only males were used and these were liberated in lots of 200-500 each. Nearly all were captured within 15 days of liberation at points varying from a quarter mile to 1½ miles from the starting place, the flight being greatly influenced by the wind. As the prevailing wind is from the mountains, which are covered with wild guavas in which the pest breeds in enormous numbers, the writers express doubts as to the utility of the clean culture methods recommended by the Board of Agriculture of the Hawaiian Islands.

Severin (H. H. P.), Ph.D. & Hartung (W. J.). **Will the Mediterranean Fruit Fly** (*Ceratitis capitata*, **Wied.**) **breed in Bananas under Artificial and Field Conditions?**—*Jl. Econ. Ent.*, Concord, N.H., v, Dec. 1912, pp. 443-451.

The authors summarise their results as follows:—

We are hardly justified in drawing conclusions as to whether or not the fruit fly will breed in green Chinese bananas under natural conditions from the results of the investigation carried on under artificial conditions.

From 452 eggs which were placed in different parts of green Chinese bananas, only two fruit flies succeeded in completing their entire life-history. One hundred of these eggs were planted within the peel of the bananas and 4 days later 69 eggs had hatched; but all of these maggots died, probably from the effect of the tannic acid. From Chinese bananas which were not quite so green as those used in previous experiments, 42 per cent. of the eggs that had been inserted within these gave rise to adult flies. The majority of the maggots that were inserted when they were about half-grown within the pulp of the fruit died in the acid medium. Nearly full grown maggots, when placed within green Chinese bananas, usually completed their larval development, but often pupated within the fruit.

Mediterranean fruit flies were bred both under artificial and field conditions from ripe and over-ripe bananas with the peel intact and from ripe bananas with the pulp exposed. Under laboratory conditions, the peel of a green Chinese banana was removed around a longitudinal split extending within the pulp; decay set in along this crack and from this banana fruit flies were also bred. Under field conditions, green Chinese bananas were hung among the branches of lemon trees; and from these bananas, when they became ripe and over-ripe, adults were reared. Fruit flies also emerged under field conditions from two bananas which were removed from the bunches of banana trees that had been cut down during the mosquito campaign in Honolulu. One of these fruits was decayed at the flower-scar and a bruise extended through the peel beneath this region; this banana was yellow in colour below the decayed area and gradually shaded over to green towards the attached end.

*Report of the Dept. of Agriculture, Nairobi, British E. Africa,* 1911-12.

Mr. T. J. Anderson reports considerable damage to wheat by aphis, *Toxoptera graminum*, a pest first recognised in America in 1882, since when there have been several more or less destructive outbreaks of it in the Southern States. It has done great damage in Italy, Hungary and Belgium, and was reported from Bloemfontein, South Africa, in 1907. It is known in Western Canada, but not in the East. The food-plants include oats, wheat, spelt, barley, oat-grass, couch-grass, wild barley and maize.

This aphis south of 33° N. lat., except at high altitudes, breeds all the year round without the production of true sexes. Dry hot summers appear to be fatal to it, unless there be a large supply of succulent food. Its average life is 26 days and there is an average of 13 generations in the year; the first young appear about 6 days after birth and the average number produced by one aphis is 28·2. Temperature has a great influence upon its numbers and it is possibly for this reason that sexual forms and eggs occur, so far as is known, only over the northern portion of its range. In America outbreaks have occurred only after winters with a temperature above normal, followed by springs with a temperature below normal. One of the most important natural enemies of *Toxoptera* is a Braconid (*Aphidium testaceipes*) which lays its eggs in the body of the aphis, the imago emerging in about 15 days. During this period the capacity of the aphis for damage is diminished and the average of young is reduced to a maximum of eleven. It has been found that one *Aphidius* will parasitise as many as 206 *Toxoptera*. The parasite is not active much below 56° F., whereas the aphis will reproduce at or even below 40° F.

The most effective remedies against the pest are the ploughing up of infected areas, to be followed at once by harrowing and rolling. Covering infested spots with straw and burning was found to prevent the spread of the pests; spraying, rolling and

brush-dragging are not satisfactory remedies. Crop rotation and keeping the ground thoroughly clean and free from weeds or self-sown grain should be practised.

Wheat was first grown in Njoro in 1907-8 and the aphis was first noticed in 1909-10, about 25 acres on one farm being attacked. The attack was repeated in the next year over 60 acres on the same farm and slightly on another about 3 miles away. In 1911-12 over 3,000 acres of wheat were destroyed (50 per cent. of the area) and of the remainder much was damaged. The total loss was estimated at 60 per cent. of the crop, not all however due to aphis attack, unequal distribution of rain being responsible to some extent. Heavy rains acted as a check, but when these were over the pest became more serious than before; the growing points were attacked and the plants ultimately killed. In some cases the aphis appeared to turn back across the wheat-fields on reaching the rough grass outside, which was presumably distasteful to it.

PADDOCK (F. B.). **The Sugar-beet Web-worm** (*Loxostege sticticalis*, **Linn.**) *Jl. Econ. Etom.*, Concord, N.H., v, Dec. 1912, pp. 436-443.

This Pyralid moth did great damage in the sugar-beet fields of Colorado in the summer of 1909—a similar but shorter outbreak having taken place in 1903. F. H. Chittenden (Bur. Entom., Bull. no. 33) says that the insect is an importation from abroad. It was found in Utah in July, 1869; in Central Missouri in 1873; first appeared in Colorado in 1891, but did not become a pest till 1903; first outbreak as a pest in Nebraska, 1893; in Michigan, 1899. This species is known to European entomologists as *Eurycreon sticticalis*, L.

*Food-plants*:—Pig-weed (*Amarantus*), lamb's quarter (*Chenopodium*), beets, onions, cabbage and lucerne in America. In Europe on a pig-weed (*Artemisia*), bind-weed, wolfsbane, corn, the blossoms of plum, apple, cherry and peas, and grasses.

*Losses*:—Growers estimate these at 35-55 per cent. in tonnage, 2-5 per cent. of sugar content and a corresponding decrease in the purity of the juice.

*Review of the season of* 1909:—At Sterling, Colorado, 18th-30th June, moths of the first brood numerous on weeds and alfalfa near beet fields; by 15th July, moths of second brood numerous in beet fields; 25th July, general outbreak of the worms over entire district, moths becoming scarce; maximum of larvae 26th-31st July; much spraying was done 1st-12th August; by 23rd August moths of the third brood were numerous in areas badly eaten by last brood and spread to the leaves of beet surrounding the damaged area; by 29th August the moths were becoming scarce and unable to fly; parasites, *Agathis (Cremnops) vulgaris*, Cress., taken 30th August; moths entirely disappeared by 1st September. Lantern-traps failed against the second brood; they were put out too late, as the moths fly at night only during the first few days after emergence. Paris green was used as a spray without effect

and the beet leaves were badly burned by it; white arsenic gave the same result; tobacco decoction (1 lb. stems to 1 gallon water) was effective, killing the larvae without damage to the leaves. Kerosene emulsion (10 per cent.) was found useless.

*Season of* 1910:—An outbreak was expected and the following observations made, again at Sterling, Colorado. On 13th May, a few moths noticed on weeds some distance from the beet fields; cold and wind retarded activity; fertilisation not general till 30th May. First eggs observed 8th June; by 17th June caterpillars abundant, moths practically disappeared; parasites taken frequently from 21-29th June. On 11th July moths of second brood were taken; by 13th July they were very abundant, though localised: the first eggs were seen on the 16th and the moths were spreading over the entire fields; the maximum of larvae was reached about 22nd July; parasites of this brood were plentiful and clearly affected the number of caterpillars. A few moths of the third brood were seen on 1st August, but there were hardly any larvae of the brood owing to the operations of the parasites.

*Season of* 1911:—Very few moths and these mostly on weeds and in neglected places; no injury to beet and it will probably be several seasons before the pest becomes serious again.

*Life-history*:—This species is active at night only in early life and never after egg-laying has begun. The moths are very active during the day, laying their eggs on the under sides of the leaves; if disturbed they do not fly far. The eggs have been estimated at 500-700 per moth, and are usually deposited singly, but sometimes in rows of 3 or 5 overlapping. As a rule the moths are seen 7-10 days before any larvae are found. The larva lives 14 days, but does not eat during the last 3 or 4 days. The injury is done so quickly, often within 36 hours, that the farmers imagine the pest to have migrated from adjoining fields during the night. A peculiarity of the attack is that it is always towards the centre, rarely or never along the edges of the field. A small area of attack spreads daily, the moths laying their eggs radially from a centre. Fields specially weedy in the previous season seem to suffer much. Soil has no bearing on the attack; one field may be attacked and the next untouched. The young tender leaves are always the last to be eaten. The beets are rarely touched and the crown hardly ever destroyed. Badly gnawed beets usually put out 3 or 4 small crowns of leaves. Pupation takes place in the ground in a tough silken cocoon, ½" to ¾" below the surface. Hibernating larvae pupate in May and soon emerge as moths. These yield the June brood of larvae, which are seldom observed and are not abundant; they are found on goosefoot, pig-weed and alfalfa.

The second brood reaches its maximum in the latter half of July, is very short-lived and requires only 14 days for the appearance of the moths. This is often *the* destructive brood, feeding entirely on beets. The third brood reaches a maximum in the latter half of August and is often also very destructive; the larvae enter the ground to hibernate, though a few pupate and emerge as moths late in September. There thus may be three full broods and a partial fourth in a season.

*Remedies*:—Lantern-traps used early (see above), and large fires at night in adjoining fields are useful. The fields must be kept free from weeds. Where fields are irrigated, a small stream of water will localise an attack. Autumn ploughing will do more than any other farm operation to prevent an outbreak, by exposing the cocoons and larvae to birds and frosts; crop rotation is also a great aid. Arsenate of lead as powder or spray, applied early, seems to be the best insecticide; 2 lbs. dry powder per acre, or 2 lbs. in 50 gallons of water as a liquid spray. If Paris green be used 1 lb. per acre dry, or 2 lb. to 50 gallons of water with 1 lb. lime added, is all that can be safely applied.

*Natural enemies*:—Blackbirds, meadow larks, English sparrows and quail; in Europe the sparrow heads the list. This pest is unusually subject to parasites, *Agathis vulgaris*, Cress. (BRACONIDAE), being the commonest, and laying its eggs either in the larva or the pupa. A secondary parasite *Mesochorus agilis*, Cress. (ICHNEUMONIDAE), limits its numbers however. A short bibliography is appended to the paper.

BARTLETT (O. C.). **The North American Digger Wasps of the Subfamily** SCOLIINAE. *Ann. Entom. Soc. Amer.* (Columbus), v, Dec. 1912, pp. 293-340, 1 plate.

The author describes nineteen species and two genera, four new species and one unidentified subspecies. Latreille regarded *Scolia punctata* as parasitic upon a certain species of bee building in old wood; Shuckard has caught it entering the cells of *Osmia bicornis*, and this has been confirmed by Robineau Desvoidy. Ashmead says that, so far as known, the species are parasitic on the subterranean larvae of beetles of the family SCARABAEIDAE, many of which are important agricultural pests. Burmeister was of opinion that *Scolia campestris* in Brazil lives in ant-hills and feeds on the larvae of *Atta cephalotes*, the leaf-cutting ant. There would seem to be a considerable body of evidence that the larvae of SCOLIIDAE prey upon the larvae of a great many different insects and further investigation of their habits is very desirable.

HOULBERT (C.). **Dégâts Produits par** *Criocephalus rusticus* **dans les bois de construction.** [Damage caused by *C. rusticus* in building timbers.]—*Insecta*, ii, no. 24, Dec. 1912, pp. 302-310, 1 pl., 6 figs.

Specimens of roof timbers were sent in May, 1912, by the architect of the Department d'Ille-et-Vilaine to the entomological station at Rennes. These timbers, the ordinary fir of the district, were seriously damaged by Longicorn beetles (*Criocephalus rusticus*), which in some cases appeared to have emerged by piercing plates of zinc. The timbers were reduced to a mere shell as thin as writing paper, and in two cases at least (fig. 2) the insect had bored through the solder which had been used to repair nail holes in the zinc plates. The metal penetrated had a hardness of 3, as compared with lead, 1·5. The following

Coleopterous larvae are stated to be capable of boring metal:—*Bostrychus capucinus*, L., *Callidium sanguineum*, L., and *Hylotrupes bajulus*, F.

A bibliography of the subject of metal piercing by insects is appended.

SURCOUF (J.). **Note sur deux Insectes Parasites des Cultures en Algérie.** [Note on two insects living on cultivated crops in Algeria.]—*Insecta*, ii, no. 24, Dec. 1912, pp. 311-313, 2 figs.

The summer of 1912 in Algeria was very dry and certain insect pests which were believed to be on the decrease broke out again in serious numbers. The maize at Rocher Blanc, near Corso, was partly destroyed by a Noctuid, *Sesamia vuteria*, Stoll (*nonagrioides*, Lef.). The caterpillars, which are almost colourless, live in the interior of the spathes and devour the young cobs; millet and sorghum were attacked when maize was wanting, also canes.

The orange trees were badly attacked by *Ceratitis capitata*, Wied.

HARRISON (J. W. H.). **An Unusual Parsnip Pest.**—*Entomologist*, xlvi, Feb. 1913, p. 59.

The writer noticed in North Durham last year enormous damage to seed in parsnip plants. The flowers and immature seeds seemed to be spun together in masses through which silk-lined tunnels passed in all directions. No seed was produced and in many cases the plants were killed. Two larvae were obtained from one plant and proved to be those of *Depressaria heracliana*. The natural food-plant of *Depressaria* is *Heracleum sphondylium*. Both the plant and the pest are known in Canada.

The best remedy appears to be to hand-pick the flowers of the parsnips late in June or early in July. The attacks of ichneumons are of no importance; not 1 per cent. is parasitised. The common earwig is more effective, destroying hundreds of pupae.

MAXWELL-LEFROY (H.). **The Psylla Disease of Indigo in Behar.**—*Agric. Jl. of India*, viii, pt. 1, Jan. 1913, pp. 1-25, 4 plates.

The indigo crop of Bengal was estimated to have been reduced about one-third in 1890 by the attack of an insect then named *Psylla isitis*; it occurred in South Arcot in 1905 and has been found in Cawnpore in 1912; in 1907 it was abundant in Behar, where it was believed to be indigenous. Two possible reasons for this outbreak were suggested, namely, unusually favourable weather and the cultivation of the Java plant throughout the year, which serves to maintain the insect through the winter. Indigo is still grown in Madras, the United Provinces, and the Punjab on the old system in use before Java indigo was introduced, and although *Psylla* is found in these localities, it is not

a serious pest, being completely kept in check by natural causes. The author believes that the change in the method of growing indigo explains its remaining as a serious pest in Behar.

*Existing diseases.*—The Java plant of to-day differs markedly from the plant grown in 1905-06 when Java was first introduced. Two distinct diseased conditions are noticeable:—(*a*) the plant grows weakly, the leaves droop, wither and turn black, and the shoots die; this rarely occurs in "Moorhun" plants; (*b*) the leaflets become crisp, curl longitudinally towards the midrib, turn yellow and fall off; in place of the long growth there is a smaller cluster of leaves at the tip of the shoots, which eventually dry up. The author regards these two appearances as distinct, and they may occur on the same plant; the latter condition having as yet no name he calls it "X." When *Psylla* is present the leaflets curl irregularly; the apical shoot curls into a compact knot with the leaflets, and it is almost always only the tip which is affected. If the *Psylla* remain long on the plant the tip dies and side shoots develop. This has been proved in the laboratory. The author is convinced that the only disease of indigo for which *Psylla* is responsible is that in which the tips and leaves curl, and this for the following reasons:—(1) Java indigo at Cawnpore shows no other disease than that due to *Psylla*; (2) plants grown in the insectary and well infected with *Psylla* show no symptoms of either of the other diseases; (3) there is no correlation in the field between abundance of *Psylla* and large loss of plants from "wilt" or "X"; (4) plants growing in the field, and showing all forms of disease do not show any less increase of "X" when *Psylla* is kept down by spraying than when it is not; (5) Sumatrana indigo is heavily infested with *Psylla* and shows no sign of "X"; (6) the localised occurrence of "X" on individual shoots bears no relation to the relative occurrence on these shoots of *Psylla*.

The author regards the "X" disease as the chief cause of loss and that there is an organism or a definite physiological cause quite independent of *Psylla*, the part played by the insects being well-known.

*Effects produced by* Psylla *on the plant.*—The results of *Psylla* attack are different in the two varieties owing to their different habit and structure; the Java tip curls into a hard knot, that of the Sumatrana into a less compact mass. Curling is caused by the operations of one or two nymphs and generally begins about two days after they are put on the plant. The curling is not permanent; a plant infested on 17th Feb. was free from *Psylla* on 1st March, and by 29th March the curling had disappeared; the adult forms do not cause this malformation. In 1907 Sumatrana was more attacked than Java; the reverse is now the case.

*Life-history of* Psylla.—The eggs are laid singly on the stem, leaf-stalks, or leaflets. On hatching the nymph moves away from the egg-shell, feeds by sucking the plant juices, and moults five times at intervals of two to five days; it then reaches the state of a perfect winged insect; the nymph is nearly as flat as a common bed-bug. The females begin to lay eggs three or four days after becoming winged, and continue to lay during 8-26 days.

but usually die in 14 days; the males die sooner. The total period of a generation is from 23-33 days, shorter in hot weather, longer in cold. It is certain that the adult is not dependent upon indigo, but can live on other plants, though it does not lay eggs on them. The nymph stage however is passed on the indigo plant and only there, the period from the egg to the final moult lasting not more than 20 days in warm weather. The average number of eggs laid is put by the author at 500; a range of 274-828 has been observed.

In Dec.-Jan. winged adults and some nymphs are to be found on the young Java or on the plants left over for another year; these breed in March or earlier, according to the season, and from March onwards breeding is slow. In June-July the crop is cut, and if there be standing indigo alongside, the *Psylla* can transfer themselves to these plants. A number live on the cut stumps; when these are covered all but the winged ones perish, and the latter either fly to indigo elsewhere or live over on other plants till the indigo grows again; in the latter case they start egg-laying and breed rapidly till November, when the cold checks them and they live on without breeding until February.

If the cutting of the crop be properly done nearly all the nymphs are carried off with the plants; mainly winged adults are left, and as there are no nymphs for the enemies to feed upon, they go elsewhere. When the crop grows the adult *Psylla* is still there and can breed unchecked; in this way the enormous increase in July and August can be accounted for.

*Food-plants.*—The cultivated indigos of India are regarded by Prain as introduced plants. It is thought that the *Psylla* is an indigenous insect and that it has acquired the habit of feeding on indigo; possibly it fed originally on some wild plant containing indican; Prain mentions *Indigofera linifolia* as growing wild in Behar. Trials have been made with other indigos; the nymphs will feed and develop on *I. oligosperma*, *I. pauciflora*, and *I. anil*, which however are not wild species in Behar; no success was obtained with *I. (?)tinctoria* or *I. linifolia*. It is almost certain that *Psylla* has a wild food-plant in Bengal, but it has not yet been found. *Psylla* reappears unaccountably after floods and on land planted for the first time with indigo and far distant from other indigo crops. In captivity the adult will live 40 days on indigo, but on no other plant tried has it lived more than four days. Prior to 1905-06 or thereabouts, Sumatrana was the indigo grown, and the author believes that if indigo were again grown on the old system *Psylla* would cause only minor damage. Seed cultivation should not be practised in Behar, and under no circumstances should indigo be grown from November to March.

*Enemies.*—Three Coccinellids (*Coccinella 7-punctata*, *Chilomenes sexmaculata*, and *Brumus suturalis*), a *Chrysopa* (*C. alcestes*), a Syrphid (*Pelecocera sp.*), a Mantis (*Hierodula westwoodi*), and a spider actually eat the *Psylla* nymphs, but possibly to a large extent only in the absence of other insects. There is also a parasite which lays its eggs on the body of the nymph and destroys it. The author thinks that a change in the cultivation of

indigo has at least temporarily upset the balance between *Psylla* and its insect enemies, and that for the moment *Psylla* has got the upper hand.

*Preventives.*—(1) Cut each plant as near the ground as possible and leave no shoots; (2) cut *every* plant, leave none; (3) cut as large an area as possible at the same time; (4) plough and hanger the crop after cutting.

The infestation is very rapid, *e.g.*, a crop sown in the second week of May at Pusa was badly infested before 3rd July. A plot cut on 12th July and every scrap of green stuff removed showed eggs on 28th July and curled heads on 31st July; this plot was about 50 yards from another.

The author repeats his remark that *Psylla* will remain a pest so long as the present system of cultivation is adhered to.

*Direct remedies.*—Shaking the plants will not dislodge the insects: lights do not attract them: trailing a sticky rope or cloth over the fields gives very poor results; cutting the tips in July was found useless, though the author thinks that if properly done by hand, not by machine, good results will follow; the cut tips should be kept in boxes covered with gauze or cloth and the cloth lifted daily to allow parasites to escape. Spraying with soap solution has been tested and found to give good results. Low surface tension is essential and the addition of creosote was found to raise it and so diminish its wetting power. (See below.)

The paper concludes with an account of the "Auto sprayer" and the cost of the operations. No spray has been found which will kill the eggs.

VERMOREL (V.) & DANTONY (E.). **Tension superficielle et pouvoir mouillant des insecticides et fongicides. Moyen de rendre mouillantes toutes les bouillies cupriques ou insecticides.** [Surface tension and wetting power of insecticides and fungicides: a method of increasing the wetting power of copper spraying mixtures or insecticides.]—*C.R. Acad. Sci.*, cliv, no. 20, 13th May 1912, p. 1300.

The authors find that, (1) solutions having different surface tensions have the same wetting power; (2) the wetting power varies greatly with the nature or physical state of the materials to be wetted.

The wetting power of a solution on plants depends upon the ease with which the liquid forms thin plates and on the resistance of these plates, rather than on the surface tension. Whatever may be known as to the wetting power of a solution in respect of a particular vegetable or other material, it is not possible to predict that it will behave in the same manner on other vegetables and other material.

The practical result of these physical researches is the discovery that gelatine is infinitely more active in destroying surface tension and promoting wetting than soap, and 10 to 15 grms. of gelatine dissolved in boiling water and added to each hectolitre of spray liquor will wet vines and young grapes perfectly.

DYAR (Harrison G.). **Notes on Cotton Moths.**—*Insecutor Inscitiae Menstruus*, i, 27th Jan. 1913, pp. 1-12.

The author gives a key to 27 species of moths belonging to the genera *Alabama* (1), *Cosmophila* (1), *Gonitis* (2), and *Anomis* (23), many of which are known to feed on the leaves of cotton in the larval state: taxonomic notes on each species are also given. One new species of *Gonitis* and six of *Anomis* are described.

HEWITT (C. G.). **Legislation in Canada to Prevent the Introduction and Spread of Insects, Pests, and Disease Destructive to Vegetation.**—*Dominion of Canada, Depart. of Agric., Expt. Farms Bull.*, No. 12, Second Series, 1912, pp. 36.

The object of this bulletin is to provide general information for farmers and others, who may be concerned in the importation of vegetation into Canada, as to the restrictions imposed by the Government in order to prevent the introduction of injurious insects and other pests.

The danger of such introduction is probably greater in Canada than in any other country. The importation of nursery stock is very large and this is liable to be infested with pests and diseases which do not occur in Canada, but which may establish themselves and do enormous damage because the chief means of control in the countries in which they are native, namely, their natural parasites and other enemies, are not usually brought with them into new countries; and it is a fact that most of the serious insect pests in Canada were not originally natives of the country, but have been introduced or have migrated. For example, the San José scale *Aspidiotus perniciosus*, Comst., originally introduced into the United States from Asia, was first recorded in British Columbia about 1894; the Pear Leaf Blister-Mite (*Eriophyes pyri*, Nalepa) was first observed in Nova Scotia in 1887; the Brown-tail Moth was originally introduced into the State of Massachusetts from Europe in 1890; the Narcissus Fly (*Merodon equestris*, F.) has been introduced from Europe into British Columbia and Ontario. (An account of the invasion of pests into Canada is given in Bulletin 9 of this series—Bulletin 4 of the Division of Entomology.)

*Dominion Legislation.*—The Destructive Insect and Pest Act, 9-10 Edward VII., is set out at length, and comprises regulations for persons importing nursery stock into Canada, and also instructions to Customs Officers.

*Provincial Legislation.*—The Provinces of British Columbia and Nova Scotia inspect and fumigate, if necessary, all nursery stock and fruit, etc., imported into the provinces. The Province of Nova Scotia fumigates and inspects stock coming from other parts of Canada only.

The Act under which British Columbia carries out these regulations is entitled The Agricultural Associations Act, 1911

(1st March), and the 3rd Schedule contains the following list of 36 insects officially recorded as pests:—

Angoumois grain-moth (*Sitotroga cerealella*, Ol.).
Apple aphis (*Aphis pomi*, L.).
Black scale (*Saissetia oleæ*, Bern.).
Black peach aphis (*Aphis persicæ-niger*, Er. Sm.).
Brown-tail moth (*Euproctis chrysorrhœa*, L.).
Buffalo tree-hopper (*Ceresa bubalus*, F.).
Cherry aphis (*Myzus cerasi*, L.).
Cherry scale (*Aspidiotus forbesi*, Johns.).
Codling moth (*Carpocapsa pomonella*, L.).
Cottony cushion scale (*Icerya purchasi*, Mask.).
Cottony maple scale (*Pulcinaria innumerabilis*, Rathv.).
European fruit scale (*Aspidiotus ostreæformis*, Curt.).
Fall canker-worm (*Alsophila pometaria*, Harr.).
Flat-headed apple-tree borer (*Chrysobothris femorata*, F.).
Granary weevil (*Calandra granaria*, L.).
Greedy scale (*Aspidiotus rapax*, Comst.).
Gipsy moth (*Porthetria dispar*, L.).
Hop aphis (*Phorodon humuli*, Schrank).
Lesser apple worm (*Enarmonia prunivora*, Walsh).
Mediterranean fruit fly (*Ceratitis capitata*, Wied.).
Orange scale (*Aonidiella auranti*, Mask.).
Oyster-shell scale (*Lepidosaphes ulmi*, L.).
Peach borer (*Sanninoidea exitiosa*, Say.).
Peach twig-moth (*Anarsia lineatella*, Zell.).
Purple scale (*Lepidosaphes beckii*, Newm.).
Putnam's scale (*Aspidiotus ancylus*, Putn.).
Raspberry root-borer (*Bembecia marginata*, Harr.).
San José scale (*Aspidiotus perniciosus*, Comst.).
Sinuate pear-tree borer (*Agrilus sinuatus*, Oliv.).
Soft scale (*Coccus hesperidum*, L.).
Strawberry crown-borer (*Tyloderma fragariæ*, Riley).
Strawberry leaf-roller (*Ancylis comptana*, Fröhl.).
Tent caterpillar (*Malacosoma americana*, F.).
West Indian peach scale (*Aulacaspis pentagona*, Targ.).
Woolly apple aphis (*Schizoneura lanigera*, Hausm.).
Yellow mealworm (*Tenebrio molitor*, L.).

The Province of Nova Scotia passed a San José Scale Act and a Black Knot Act in 1900, but the arrival of the Brown-tail Moth pointed to the necessity for more comprehensive measures and accordingly the Injurious Insect, Pest and Plant Disease Act was passed in March, 1911. This Act is quoted in full, as is also the Fruit Pest Act (10 Edward VII.) of the Province of Ontario and the Acts of the Government of Prince Edward Island to prevent the spread of the "potato bug" (April 27th 1883), and of the "black knot" on plum and cherry trees (April 19th 1895).

GOWDEY (C. C.). **An Account of Insects Injurious to Economic Products and their Control.**—*Dept. of Agric., Uganda Protectorate, Entebbe*, 1912, pp. 1-32.

In this publication the author in the introduction gives a very brief description of the orders of insects and gives a list of

insects injurious to various crops, with a short account of each species and its habits, and methods of prevention and remedies, as follows:—

COFFEE.
- Scale Insects (*Ceroplastes ceriferus*, And., *Ceroplastes galeatus*, Newst., *Ceroplastes vinsonoides*, Newst., *Pulvinaria psidii*, Mask.).
- Mediterranean Fruit Fly (*Ceratitis capitata*, Wied.).
- Coffee Beetle (*Stephanoderes coffeae*, Haged.).
- Crickets (*Gryllotalpa africana*, P. de B.).
- Boring Beetle (*Dirphya princeps*, Jord.).

CACAO.
- Cacao Fruit Fly (*Ceratitis punctata*, Wied.).
- Scale Insects (*Stictococcus dimorphus*, Newst.).
- Cacao Beetle (*Adoretus hirtellus*, Castn.).
- Plant Lice (*Aphis sp.?*).
- Crickets (*Gryllotalpa africana*, P. de B.).

COTTON.
- Cotton Stainers (*Dysdercus nigrofasciatus*, Stal, *Dysdercus pretiosus*, Dist., *Oxycarenus gossipinus*, Dist., *Oxycarenus hyalipennis*, Costa.).
- The Leaf-footed Plant Bug (*Leptoglossus membranaceus*, F.).
- Cotton Aphis (*Aphis gossypii*, Glover).
- Bollworm (*Earias insulana*, Boisd.).
- Millipedes (*Odontopyge sp.?*).
- Scale Insects (*Pulvinaria jacksoni*, Newst.).
- Cutworms (NOCTUIDAE).

RUBBER.
- Scale Insects (*Pulvinaria psidii*, Mask.).
- Castilloa Borer (*Inesida leprosa*, F.)
- "White Ants" (*Termes bellicosus*, L.).
- Thrips.

CITRUS TREES.
- Orange Butterfly (*Papilio demodocus*, Esp.).
- Citrus Psylla (*Trioza sp.?*).
- Plant Lice (*Aphis citri*, Ashm.).
- The Purple Scale (*Mytilaspis citricola*, Pack.).

SWEET POTATOES.
- Sweet Potato Weevil (*Cylas formicarius*, F.).
- Sweet Potato Caterpillar (*Acraea terpsichore*, L.).
- Sweet Potato Beetle (*Conchyloctenia punctata*, F., var. *parummaculata*, Boh.).

PALMS.
- Palm Weevil (*Rhynchophorus phoenicis*, F.).
- Scale Insects (*Chionaspis substriata*, Newst., *Aspidiotus cydoniae*, Comst.).

TEA.
- Scale Insects (*Aspidiotus sp.?*).

A chapter follows on insecticides, with their methods of preparation and use, and a table showing the standard strength for sprays, with some directions for killing, preserving, and packing insects.

NOEL (P.). **Les ennemis de l'arroche.** [Insect enemies of "Garden Orache" (*Atriplex hortensis*).]—*Bull. du Laboratoire Régional d'Entomologie Agricole, Rouen*, 1st quarter, 1913, pp. 6-8.

The author gives a list of no less than 57 insects which feed upon this vegetable, so that despite the freedom of its growth, it is not always possible to obtain a sufficiency of perfectly sound leaves for the purposes of the kitchen. The list comprises, 3 Coleoptera, 6 Rhynchota, 34 Lepidoptera, 11 Diptera, and 3 Acarids.

DEWITZ (J.). **The bearing of Physiology on Economic Entomology.** —*Bull. Ent. Research*, iii, pt. 4, Dec. 1912, pp. 343-354.

In this paper the author draws attention to the fact that hitherto physiological research, so far as injurious insects are concerned, has been almost entirely neglected, whereas it should be made one of the main starting points in the study of insect pests.

So far back as 1787 lighted candles and fires were used for the systematic capture of the "vine moth" and the practical application of the phenomenon of phototropism for this purpose has now reached a considerable degree of perfection. [*Cf.* this Review, ser. A, pt. 1, pp. 8-9.]

The natural tendency of certain organisms and, among them, insect larvae, to seek contact with their fellows and to squeeze themselves into corners, has made the capture of certain caterpillars possible by simple methods such as the fastening of belts, paper bands and strips of cloth around trees and vines, and has led to the use of flat stones or wooden boards for catching earwigs and slugs. Attention is also drawn to observations which have been made on the tendency which has been noticed amongst certain insects to fly against the wind. The sense of smell in insects and the use to which it has been put since 1910 for capturing the "vine moths" is referred to. The author then proceeds to discuss the influence of heat and cold upon insects and their larvae. It would appear that only when cold occurs suddenly after mild temperatures or out of season, does it become fatal to insects. On certain species, however, cold has a peculiar effect, which is equally observable in normal winter time as in the colder regions of high mountains or in the Arctic regions. Such insects, and the females in particular, especially of Lepidoptera and Diptera, become wingless. This result has been obtained experimentally, and the author comes to the conclusion that wingless insects result only when cold is applied to pupae and nymphs. Great humidity has the effect of stopping the spinning of the cocoons of many larvae; this is probably due to some balancing of osmotic pressure between the silk fluid within the caterpillar and the moisture in the external air. The author has also observed in the case of *Lasiocampa quercus* and *Eriogaster lanestris* that there is apparently a definite time of day at which the caterpillars spin. He has some hope that a careful study of the effect of these

external conditions in hastening or delaying the development of the insect, may result in some practically useful method of applying the knowledge gained.

The author points out how little is known of the real mode of operation of many useful insecticides, and that in many cases their supposed mode of operation is probably not the real one. He lays great stress upon the effect of a diminished supply of oxygen to insect larvae and is inclined to believe that the fatal effect of "contact" insecticides, whether liquid or powder, is due to their action upon the sense organs of insects, and that they do not merely cause suffocation, as is generally supposed.

The paper concludes with a full bibliography of the subject.

BUTTRICK (Philip L.). **Notes on Insect destruction of fire-killed timber in the Black Hills of South Dakota.**—*Jl. Econ. Entom.*, v, no. 6, Dec. 1912, pp. 456-464.

In this paper an attempt is made to give an outline of the results of the work of insects following forest fires in the Black Hills of South Dakota and to suggest remedies for their depredations.

Western Yellow Pine (*Pinus ponderosa*) is the predominant tree and the only commercial tree found, occurring unmixed over large areas. The chief insect enemy, the "Black Hills Beetle" (*Dendroctonus ponderosa*, Hopk.) is too well known to require description. It is now controlled by natural agencies, and by cutting large bodies of infested timber, for which a careful watch is kept. A leaf-scale, probably *Chionaspis pinifoliae*, occurs chiefly on seedlings and saplings, its attack being sometimes fatal. The climate is dry and fires numerous and severe, especially in the young growth. Many thousands of feet of otherwise merchantable timber are killed annually. Much of this is never used and methods of preventing its destruction by insects are therefore valuable. The chief insects infesting dead timber in the Black Hills are the ambrosia beetles, *Gnathotricus sulcatus*, Lec., and *G. occidentalis*, Hopk. They appear to attack injured rather than dead trees. The adults seem to fly throughout the growing season, and to hibernate in their burrows during the winter. Several generations are doubtlessly produced in a season.

The Cerambycid and Buprestid beetles, whose larvae make large burrows deep into the wood, are more important than the ambrosia beetles. The chief damage is done by a Buprestid which is probably *Chalcophora virginiensis* (the Heartwood Pine Borer) or one of its western forms, *oregonensis*, or *angulicollis montana*. The adults fly in July and by the third week of that month the woods are full of them, but they disappear by the first week in August. The eggs are laid in holes cut in the bark, occasionally in living, but more often on recently dead trees. They hatch in a few days and under favourable circumstances they may enter the wood within a month, and in two months more will have bored into it two inches. The larval stage lasts till the following season and may last for two years. They cease operations when cold weather sets in and the wood freezes. If the timber be cut before

it is badly infested by the larger borers the work of the ambrosia beetles is usually removed with the slabs. The larger borers will in time so riddle a log that it is worthless except as firewood, and in a single season may reduce its value from 30 to 50 per cent.

Severity of attack by boring beetles varies with the season of the fire. It can of course take place immediately after one, only during the season when the adults are flying. The further removed from this period the fire occurs, the less will be the severity of the beetle attack, since the wood has more chance to dry out and the bark to become detached. The greatest damage follows upon fire occurring early in the growing season. The moisture of the wood produces fermentation and with the rise of temperature the larvae grow rapidly, becoming well established before seasoning of the wood and cold weather interferes. On a large area burned about the middle of June, infestation by the end of August was so severe that the ground under the trees was white with "frass," which could be seen drifting to the ground like a light snow, and the author declares that "the gnawing of the larvae sounded like the croaking of innumerable frogs." An area close by which was burned in March was much less severely infested. As wood-borers prefer moist wood, site has some effect on their attack. They are more frequent in places sheltered from the sun and winds. The Hairy Woodpecker is very common and seems to be the chief bird enemy of the Buprestid larvae. The best remedy against these beetles is naturally the prevention of fires, and the next best thing is to harvest the burnt timber at once, especially if it can be cut and sawn within six weeks. Cutting and barking the timber is effective but is more costly than might be supposed.

A secondary damage caused by the beetles is the introduction of the bluing fungus into the burrows, which stains the wood, even though the direct damage done by the insects may not be very great. Soaking the logs in a pond has been suggested as a method of killing the borers, but the process is slow and not possible for any large amount of timber. Experiments with poisonous solutions have not been made, but they might be of some use.

Britton (W. E.), Agric. Exp. Sta., New Haven, Conn. **Notes of the Season from Connecticut.**—*Jl. Econ. Entom.*, v, no. 6, Dec. 1912, pp. 464-466.

The walnut weevil (*Conotrachelus juglandis*, Lec.) has been so destructive for several years that it has been almost impossible to obtain fruit from the various imported and cultivated walnuts. The literature of the subject is very scanty, and the weevil has generally been said to breed in the nuts, but in Connecticut the larvae do much greater damage by burrowing in the shoots, causing them to wither and die before they can produce fruit. The bud moth (*Acrobasis sp.*) attacks the new growth. It produces three generations each season. A full account of the work done in relation to the walnut weevil will appear in the 12th Report of the State Entomologist of Connecticut.

B. H. Walden has studied a sawfly which has done great damage to blackberries near Newhaven. It has been described by Professor A. D. McGillivray as *Pamphilius dentatus*. The damage done closely resembles that of the peach sawfly. Spraying with lead arsenate has been found useful.

*Pissodes strobi*, Peck., has attacked the pine trees in Connecticut. Great damage has been done by the grubs of a species of *Lachnosterna* to grass, the roots of corn, strawberries and potatoes; while in one nursery 25 per cent. of the seedling pines, spruce and deciduous trees were eaten off underground.

*Laphygma frugiperda*, S. & A. (the fall army worm), has devastated lawns in three districts and has often been found feeding upon millet.

*Alabama argillacea*, Hübn. (the cotton moth), occurred two weeks later than usual, and not in such numbers as in previous years.

*Porthetria dispar*, L. (the gipsy moth) is now regarded as under control and in some places as wholly exterminated.

*Euproctis chrysorrhoea*, L. (the brown-tail moth), has spread southwards slightly since last year, involving portions of the towns of Brooklyn, Plainfield and Sterling.

*Bucculatrix canadensisella*, Chamb., though less abundant in the eastern portion of the State than in 1910, has been found over the whole State, and has done considerable damage to yellow birches in Litchfield county.

GARMAN (H.). **Notes from Kentucky.**—*Jl. Econ. Entom.*, v, no. 6, Dec. 1912, pp. 466-469.

San José scale has been spreading in Kentucky during the past two years. The cause is unknown, but the author suspects that improperly fumigated material, or material which has never been inspected, is arriving from other States. The increase in fruit-growing may also account for the gross increase of the pest. Chinch bugs have also been doing much damage locally, and there is a demand for the white fungus with which to destroy them. *Laphygma frugiperda* (the fall army worm) did a great deal of damage in the past year to millet and alfalfa, and to rye. This is the first time for more than 12 years that the damage done by this caterpillar has attracted the attention of farmers. *Alabama argillacea* (the southern cotton worm) appears suddenly at long intervals about the electric lights in cities, where it was very common on 23rd September 1911, and again in the late summer of 1912. As Kentucky is not now a cotton-growing State it would seem that this is a migrant from the southern cotton fields.

*Diaphania nitidalis* (the pickle worm) has been more destructive than ever before. Whole plantations of cucumbers and cantaloups being so badly damaged as to be hardly fit for market. It begins work on the cucumber when about 3 inches long and continues until they are of some size. A soft rot then sets in, which soon extends through the whole fruit. It has also been found feeding on squashes and simlins.

*Oncideres cingulatus* (the twig-girdler) has done more damage in the past year than usual to persimmon, hickory and pecan trees. The latter were also much damaged by *Grapholita caryana* (the hickory shuck worm). The buffalo gnat (*Simulium*) is very common locally on low lands along the Mississippi and Ohio and is a serious pest of horses, worrying them so much that it was necessary to apply a mixture of lard and coal oil to keep it away. *Thyridopteryx ephemeraeformis* (the bag worm) used to be very common, but its parasites have appeared in immense numbers and now seem to have all but exterminated it. *Odontota dorsalis*, amongst other leaf-miners, has done a considerable amount of damage to the black locust tree, a very common road-side shade tree in Kentucky. The grapes have been badly damaged by *Polychrosis botrana*. The writer says that it is not difficult to deal with this caterpillar by careful pruning, clearing away all rubbish, and spraying, as it is generally on vines that are somewhat neglected that it does mischief.

Amongst possibly useful birds the "crow black-bird" (*Quiscalus quiscula*), common about Lexington, sometimes occurs in such great numbers that the inhabitants complain bitterly of their noise and chatter when roosting in the trees and of the litter they make in gardens and grounds, but the author has examined a number of stomachs and found that 93·8 per cent. of the food consisted of insects, chiefly grasshoppers, the rest being fragments of beetles, with traces of a few other insects; no army worms were found.

Webster (R. L.). **Insects of the year 1912 in Iowa.**—*Jl. Econ. Entom.*, v, no. 6, Dec. 1912, pp. 469-472.

*Lepidosaphes ulmi*, L.—The low temperature of the previous winter appears to have kept this insect in check, and the author notes that although at the end of May and the beginning of June eggs were to be found, hardly a single living scale-insect was seen.

*Carpocapsa pomonella*, L.—The apple crop of 1911 in Iowa was heavy, while in 1912 the yield was only 15 per cent. of the normal, the codling moth having done very great damage. In some cases orchards which had not been sprayed were attacked by the first of August to such an extent that not a sound apple was left.

*Phlegethontius sexta*, Johanssen.—This insect was very abundant on tomato plants at Ames in the autumn of 1910, though heavily parasitised. Since that time larvae have been rare. The author puts this down to the abundance of the Braconid *Apanteles congregatus* in 1910, though the *Apanteles* cocoons were themselves much parasitised by two species of hyperparasites at that time.

*Periodroma margaritosa saucia*, Hübn. This was reported as damaging alfalfa under the name of "army worms," but turned out to be the "variegated cutworm," which occasionally becomes so abundant that it adopts the habits of the true army worm.

Considerable local damage was done. The larvae were found to be heavily parasitised by Tachinid flies.

*Macrosiphum solanifolii*, Ashm.—This aphid is not generally considered a serious potato pest in Iowa, but in July it became very abundant on potatoes at Ames. The ladybird, *Hippodamia convergens*, with the aid of certain hymenopterous parasites, checked the outbreak.

SANDERS (J. G.), Coll. of Agric., Madison, Wis. **A Remedy for Chrysanthemum Leaf-Miner.**—*Jl. Econ. Entom.*, v, no. 6, Dec. 1912, p. 472.

During the spring and summer of 1912 a very serious outbreak of the chrysanthemum leaf-miner, *Napomyza chrysanthemi* (Kowarz), occurred in two Milwaukee (Wis.) greenhouses which had imported infested chrysanthemums and marguerites from Boston. Similar injuries were reported from Chicago and other points. The growers were faced with the entire loss of the flowering plants caused by complete infestation of the leaves by the mining larvae of this fly. While experimenting with contact insecticides for their control, the nicotine solutions, especially "Black Leaf 40" used as a spray, with or without whale-oil soap solution, proved a complete and satisfactory control. One part of nicotine in 400 parts of water killed the eggs and larvae readily, as well as newly formed pupae. The pupae of all ages were killed with 1-200 nicotine solution. It is evident that the nicotine affects the larvae through the leaf epidermis by osmosis. Several types of Lepidopterous and Coleopterous leaf-miners were killed by the use of nicotine sprays in an experimental way, but time was not available for field tests. It would be advisable to test this method in the control of the blackberry leaf-miner which is a serious pest in some seasons.

HEADLEE (J. J.). **Preliminary Report of the Committee on Entomological Investigations.**—*Jl. Econ. Entom.*, v, no. 6, Dec. 1912, pp. 472-484.

The chairman of the Committee on Entomological Investigations publishes a list of researches in progress in Canada and the United States. A list of investigators willing to classify specimens is appended.

GEE (W. P.). **Preliminary List of the Scale-Insects of South Carolina, with some notes on the behaviour of *Lecanium quercifex*, Fitch.**—*Jl. Econ. Entom.*, v, no. 6, Dec. 1912, pp. 484-486.

The author gives a list of 26 scale-insects with their host plants. Seven of these are noted as greenhouse species. He has also made some observations on the phototaxis of *L. quercifex*, Fitch, which tend to show that these insects seek light. The scales of

this form occur towards the outer portions of twigs on the newer wood, and the attraction of light may possibly account for their position. A number of the young scales were placed in 95 per cent. alcohol containing a small amount of strong hydrochloric and nitric acid and their movements observed. The insects did not appear to be much affected.

ROEPKE (Dr. W.). **De nieuwe parasieten van het Cacao-motje en iets over parasieten in het algemeen.** [The new parasites of the cacao moth and on parasites in general.] *Mededeelingen van het proefstation Midden-Java*, no. 5, 1912, pp. 1-21, 1 pl.

In the course of this paper the author draws attention to the question of the fertility of parasites, in that unless the parasite be more fertile than the host insect its power to keep down a pest is seriously diminished. Exact information on this point is greatly needed and especially as regards the parasitic hymenoptera (sluipwespen), though in certain cases there is no doubt that the capacity for reproduction is enormous. In the case of some members of the family CHALCIDIDAE fertility is increased by the remarkable faculty of "polyembryony," which is unique in the whole animal kingdom. This consists in the fact that each egg laid by the female in the body of the host, produces not one larva, as might have been expected, but a great number of larvae, and as a result the fertility of the insect is enormously increased.

The author then reviews several of the more important experiments that have been made in other countries in introducing parasites for the control of insect pests.

The outbreak of the *Chloridea (Heliothis)* caterpillar pest in the tobacco plantations of Sumatra led Dr. de Bussy to go to America where a species of *Chloridea* is found whose eggs are parasitised by *Trichogramma pretiosa*, Riley. All attempts to get parasitised eggs over from America in good condition for development failed. An intermediate breeding station was therefore established in Holland and the next supply of infected eggs came over from America alive, but when developed produced male *Trichogramma* only. Further consignments produced females and a number of generations were bred successfully and sent to the Deli Experiment Station, where the parasite is now being tested. (*See* abstract, *Rev. App. Entom.*, ser. A, pt. 1, p. 13.)

The paper concludes with some observations on the cacao moth (*Acrocercops cramerella*, Sn.) and the discovery of what Roepke believes to be three parasites in cacao plantations in Assinan. Until this discovery was made no parasite of the cacao moth was known to exist, despite diligent search by Drs. Zehntner and Roepke in infested plantations in Central Java and the breeding out of many hundreds of pupae in the hope of finding such a parasite. It was observed, however, in certain plantations in which nothing had been done to check the moth pest, that the amount of damage varied very greatly in different years. In one case the proportion of damaged to undamaged pods was as follows:—1907, 7:1; 1908, first crop, 28:1—second crop thrown away; 1909, first crop, 25:1—second crop, 18:1; 1910, first crop,

7:1—second crop, 35:1; 1911, no first crop—second crop, 12:1. In 1912, the parasite was found in this plantation and the figures were, first crop, 2·25:1, and second crop, 1·9:1; an improvement reasonably attributable to the operations of the parasite.

In five plantations in another district (Assinan) the ratio of damaged to sound pods was as follows:—

| | | A. | B. | C. | D. | E. |
|---|---|---|---|---|---|---|
| June 1911 | ... | 16:1 | 19:1 | 7·9:1 | 42:1 | 13:1 |
| June 1912 | ... | 3·8:1 | 12·5:1 | 6:1 | 3·7:1 | 3:1 |

In 1911 the moth pest had hardly began to be serious in May, whereas in 1912 it began very early. The above figures refer only to plantations of the "Djati-roenggo" hybrid cacao. The following figures show the relative intensity of the attack on the two varieties grown in the same group of plantations.

| | | | *Java-Criollo.* | | *Djati-roenggo.* |
|---|---|---|---|---|---|
| March 1912 | ... | ... | 53·3:1 | ... | 5·4:1 |
| April 1912 | ... | ... | 26·5:1 | ... | 3·6:1 |

As it was in the Assinan plantations that the parasites were discovered, it seems reasonable to suppose that the improvement was due to their operation. The figures show that the Djati-roenggo cacao is either less liable to the attack of the moth or more attractive to the parasites than the other variety.

The author describes and figures three species of ICHNEUMONIDAE bred from *A. cramerella*, which he denominates A, B, and C. [So far as can be determined from the drawings, the first two are considered by Mr. C. Morley to belong to the genus *Hemiteles*, Grav., while the third is referable to *Goryphus*, Holmg. (*Melcha*, Cam.).]

ROEPKE (Dr. W.). **Over den huidigen stand van het vraagstuk van het rampassen als bestrijdings middel tegen de Cacao mot op Java.** [On the present position of the problem of "rampassen"* as a method of combating the cacao moth in Java.]—*Mededeelingen van het Proefstation Midden-Java*, no. 8, 1912, pp. 1-21.

The object of the author is to set before the cacao planters a clear and reasoned statement of the objects of the operation known as "rampassen," the results obtained, and the results to be hoped for by carrying it out in the light of the experience gained in the 10 years which have elapsed since this plan of combating the cacao moth was worked out by Dr. Zehntner. The operation is based upon a knowledge of the life-history of the cacao moth, and in Dr. Zehntner's words "the time comes when the plantation must be absolutely cleared of all fruits so that the past and the coming harvest may be separated by an interval, during which theoretically no moths are to be found." (Proefst.

* [The word "rampassen," which has been left untranslated throughout this article, is a technical term implying a series of operations, the principle of which is the removal from the trees at one and the same time as far as possible of every cacao-pod which is at that stage of its growth in which it is most liable to attack by the moth, and also of all pods which are already attacked. These having served their purpose as baits are sacrificed in order to save the remainder.]

Cacao, Bull. No. 5, p. 6.) In practice, careful account has to be taken of the setting of the fruits so as to reduce the loss of fruit which the carrying out of the "rampassen" might entail. The theory of the operation takes no count of a number of conditions which arise in practice and consequently the results do not always correspond with those theoretically to be expected. Among these conditions the following are the most important:—(*a*) The "auto-infection" of the plantations as the result of a few cacao-pods being overlooked in the "rampassen"; (*b*) infection from the outside, *i.e.*, from neighbouring gardens and from "dessa-cacao"; (*c*) the danger of infection caused by the indigenous food-plants of the moth known as "kola" and "ramboetan." The first condition can only be removed by the carrying out of the operation of "rampassen" with the strictest care. The author urges that only the most trustworthy persons should be employed and that so far as possible the same hands should do the work every year. In order to ensure that no pods shall be left behind, the plantation should be crossed and recrossed in different directions by the work-gangs more than once and that each gang should be fined for any pods they may have missed, the fines to be added to the wages of the gang that discovers them. Lastly, it is recommended that all other work should be abandoned while the operations are proceeding, for unless the "rampassen" be thorough and complete it is largely labour thrown away, and on those plantations on which it is not or cannot be carried out cacao cultivation is useless.

The danger of infection from neighbouring plantations is naturally the greater the nearer these are, and unfortunately no reliable observations have been made as to the power of flight of the moth; but inasmuch as the fully developed insect is a somewhat feeble creature, the need for anxiety on this account is perhaps not great. The danger may be reduced by planting the danger zone with something which will make a natural fence. A broad belt of coffee or of Hevea makes an excellent and profitable wind-screen, but kola must on no account be used, as this is one of the food-plants of the moth. Ficus may also be used for the purpose, but is less serviceable and must be planted at some distance because of its great root-spread, which is capable of damaging the cacao plantation.

"Dessa-cacao," which grows abundantly in some parts of Java, is a source of infection by no means to be neglected. If it cannot be subjected to the operation of "rampassen" it is best to uproot and destroy it altogether, though this is by no means always easy. "Ramboetan" presents even greater difficulties, but fortunately this tree bears its fruits at a more or less definite time of year; it is known however that in exceptional conditions it bears fruit at irregular periods and thus forms a link between the cacao and the moth. The fruit of kola is regularly more or less infected by the moth, and this plant must invariably be subjected to the process; this is however difficult and troublesome to carry out, because, as the trees grow old, they form a dense crown. A further difficulty arises in that the kola fruit ripens in a shorter time than the cacao, and is therefore attacked earlier by the moth. As the commercial value of the kola trees is not

great, it is probably better to uproot them and to use some other tree as a wind-screen, otherwise care must be taken that they do not grow too high.

Up to the present no other food-plants of the moth are known, and so much search has been made for them without result that it is improbable that any others exist. Auto-infection, *i.e.*, infection arising from the overlooking of infected pods and other material, is of far greater importance than infection from outside. When it is reasonably probable that everything has been done that can be done to prevent auto-infection and infection from the outside has been excluded by the destruction of all wild food-plants, yet moth infection nevertheless occurs, the explanation is probably to be sought in the carriage of infection by carts passing through the plantations, by crows and other birds which carry off the "ramboetan" fruit, and, last but not least, by human beings who carry the "ramboetan" fruits about and carelessly throw away the husks.

The next question to be considered is the period of its growth at which the cacao-pod is liable to moth infection. Dr. Zehntner found larvae on pods only 4-5 cm. long, but they were unable either to bore into these pods or to travel from them to others. He estimated that the percentage of infection for pods of various sizes was as follows:—7-10 cm., 1 per cent.; 10-12 cm., 12 per cent.; 12-15 cm., 45 per cent.

The operation of "rampassen" is facilitated by abundant space between the plants; by proper pruning; and by the absence of any intervening catch-crops. Abundance of air and light is also very necessary to the health of the cacao plant, and the operation is much more easily performed if the trees are kept down to a reasonable height. Nevertheless, pruning is not generally adopted in Java, and the practice of growing other crops between the rows of cacao trees has many supporters in the centre of the island. It has not been proved that mixed cultivation diminishes diseases and pests; this is not true of the moth and still less so in other cases. *Helopeltis* constitutes probably the solitary exception.

The best time to carry out the operation of "rampassen" is when the cacao leaves are small, for then the risk of overlooking even small fruit is reduced to a minimum. It is well known that the plants bear better when the fruit sets during wet weather rather than in dry, and in those plantations which are harvested twice in the year, the first crop, the fruit of which sets during the rainy season, is better than the second, which sets during the dry season, one reason being that the wet greatly hinders the operations of the moth and its larvae; but the author believes that this is not of so much importance as the fact that in these plantations the "rampassen" in December-January is far more thoroughly carried out than that of June-August.

Black ants appear to be of service against the moth, at all events plantations in which they are plentiful seem to suffer less; possibly by running over the pods they hinder the moths from laying their eggs.

All the above-named small factors in the problem are only of consequence when the moth pest is not serious. It is no use

systematically collecting pupae when the moths are swarming, the only plan is not to allow the pods to become too ripe before plucking, for in this case the larvae leave the pod and go to another; whereas a pod once plucked will not deteriorate further on account of its having been attacked. If the attack of the pest be so severe that the pods will not ripen properly, there is obviously no advantage in gathering them.

Rapid harvesting is very desirable, as even under the best conditions every harvest begins with some degree of infection in the pods and delay may mean the production of a second generation of moths during the work. Almost the worst that can happen is the ripening of a quantity of small pods before the larger ones; when this occurs, the further "rampassen" which is often carried out is, in the author's opinion, useless. The ripe fruits are, in practice, separated from those which on inspection appear to be attacked, and it is entirely left out of sight that the pods which are left will yield moths, or the period of growth of the fruit must be put so low that one might as well begin the "rampassen" over again and sacrifice the whole harvest. The largest proportion of the fruit should set immediately after the "rampassen" is completed, and if this does not take place but is delayed and irregular setting occurs, great damage may be done.

The inventor of the process was doomed to considerable disappointment on the first trial, for before the beginning of the second harvest there was evidence of the presence of the pest and it was clear that the results did not correspond with theory, and the question as to whether it might not be better to carry out the operation twice in the year arose. If there be only one harvest in the year it is clear that it can only be done once, but if there be two harvests then it is open to "rampassen" once or twice: if it be done once and so thoroughly that it can be said with certainty that no fruit is left and the plantation is absolutely clean, then once may suffice, but if not so thoroughly done then it must be done twice.

The question as to whether there shall be one or two harvests in the year is more or less at the discretion of the planter. If allowed to do so, the trees will bear in a fashion all the year through, but there are two periods of maximum which constitute the proper harvest times followed by a "slack" season of shorter duration during which there is little or no ripe fruit produced. Dr. Zehntner's idea was to convert this slack period into one of no fruit whatever, ripe or unripe, in the belief that once the whole supply of food was cut off the moth pest would cease.

The question as to whether the "rampassen" process should be carried out once or twice in the year is discussed at considerable length. There appears to be much difference of opinion on the subject, and the advantages and disadvantages of each system are fully set out. Dr. Roepke himself is inclined to favour the double operation, as experience has shown that it diminishes the chances of loss; although if the conditions are exactly suitable, the single operation may be more profitable in a particular year.

Two conditions are laid down as being indispensable for securing a good harvest: (1) the harvest operations must be carried

out in the shortest possible time and must not extend over more than $2\frac{1}{2}$ to 3 months: (2) the possible yield must be at its maximum at the moment that harvest begins.

The question as to whether a certain time should be allowed for the setting of the fruit has been carefully considered by expert planters in council, but the difference of conditions prevailing in the various plantations has rendered any unanimous decision impossible.

The variety of cacao known as Djati-roenggo resists the attack of the moth better than Criollo. Not only is the proportion of pods at the beginning of the harvest considerably greater, but as the planters put it, "it keeps it up longer": that is to say, the moth infection is much slower, though this may naturally reach a maximum sufficiently high to render the yield poor. One of the reasons for this greater resistance to the moth is the harder shell of this variety of cacao: the skin is also smoother and it has been fairly proved that rough-shelled pods are more attacked than smooth ones. This enables a larger number of pods to be spared during the "rampassen," though it is quite possible that they may be attacked just a little later. Djati-roenggo requires a longer time to ripen than Criollo, and this has to be set off against the less liability to moth attack. Probably the liability to attack would be still less if the Djati-roenggo ripened earlier, and it is obviously an inconvenience and also a cause of risk that the time of flowering and setting of the fruit is not the same as that of Criollo, at all events in the younger plantations. This cannot be altered at once, but it is hoped that later it may be made to coincide by regulating the operation of "rampassen" in the Djati-roenggo plantations.

Another benefit which results from the operation of "rampassen" is that it rids the plantation of all pods attacked by fungus. There is no doubt but that it must be regarded as the great annual cleaning up, and since the method has been adopted all manner of fungus pests have practically disappeared.

The burying of all waste pods and shells collected during the operation must be strictly attended to; the destruction of the shells is not of so much consequence, but every pod should be carefully buried or destroyed. Some planters think that the pits should not be disturbed for a long time, but as a matter of fact fermentation sets in rapidly, the mass heats, and moths, caterpillars and eggs are quickly destroyed: the same pit may, in fact, be safely used again within eight days, and the cacao shells make a good manure for the plantations.

*Other methods of combating the cacao moth.*

The hopes that had been entertained of fighting the moth by the introduction of parasites have been to a large extent disappointed, inasmuch as it has been found that the insects are themselves so attacked by other parasites that there is little or no chance of their multiplying sufficiently to be of any service. From several dozens of moth pupae only one or two parasites have been obtained, and there appears to be no hope of success until some means is found of destroying or preventing the breeding of the

hyperparasites; but the author thinks that the chance of being able to effect this is very small. It has been discovered that the parasite imported from America with such pains and labour busies itself with the eggs of other Lepidoptera and takes no notice whatever of those of the cacao moth. Whatever means of combating the pest may be discovered in the future, it is now abundantly clear that Dr. Zehntner's "rampassen" method is at present the only one on which the Java cacao planters can rely, combined with the patient selection and propagation of more or less moth-resisting varieties.

BARRET (O. W.). **Roach-proof book-varnish.**—*Philippine Agric. Rev.*, vi, no. 1, Jan. 1913, p. 49.

The author recommends the following mixture:—

| | | |
|---|---|---|
| Wood alcohol or strong vino | ... | 1 litre |
| Carbolic Acid, full strength | ... | 30 grammes (1 oz.) |
| Corrosive sublimate ... | ... | 15 .. (½ oz.) |

The mixture, after shaking, should be allowed to stand for 24 hours before use and may then be applied with a piece of cloth or a small paint brush. It should not be used on soft leather or on bright coloured bindings. One application once every six months is sufficient.

The author has used this preparation successfully against cockroaches in Porto Rico, one of the worst countries in the world for these pests.

**Destruction of Lantana.**—*Jl. d'Agriculture Tropicale*, 1912, p. 154.

This plant in tropical countries becomes a nuisance on cultivated and pasture land, and attempts are being made in New Caledonia to destroy it by introducing a species of fly of the family AGROMYZIDAE from the Sandwich Islands. Seeds damaged by the larvae of the fly have been found in the neighbourhood of Numea, but the experiment appears to be a somewhat risky one, as it is by no means impossible that the fly may turn its attention to some cultivated plant and prove a worse pest than the weed which it is hoped it will destroy.

NAKAYAMA (S.). *Chilocorus similis*, **Rossi, and its relation to Scale-Insects in Japan.**—*Monthly Bull. State Commission of Horticulture, Sacramento, California*, no. 13, Dec. 1912, pp. 932-936, 1 fig.

The author states that this ladybird is exceedingly useful in Japan as it feeds on nearly all the scale-insects injurious to garden and orchard trees in that country. There are two generations in the year. The larva moults three times before pupation and the ladybird passes the winter in the adult stage, hiding under dead leaves or in the cracks of the bark. Observations as to generations are recorded. The insects deposited eggs on April

17th: these hatched on May 5th: pupation took place on 3rd June and adults emerged on the 14th. These same adults deposited eggs on the 17th June which hatched on 15th July, the larvae pupated on 12th August, and adults emerged on the 22nd August and hibernated through the winter.

The insects rarely feed on aphids, but almost entirely on scale-insects, preferring *Aulacaspis pentagona*, Targ., and *Aspidiotus perniciosus*, Comst. Observations on the amount of food taken by the insect gave the following results:—The larva hatched at midday, began to eat about 9 o'clock the next morning and in the first stage is not very voracious, not eating more than one or two young scale-insects per diem. Its appetite increases only in the fourth stage, that is to say, after the third moult, when it consumes more than 50 per diem; thus the larvae were found to eat from 700 to 800 Coccids in the total larval period, and the adult Ladybird 800 to 900. The adult lives for about 35 or 36 days. Four ladybirds, observed throughout their life, actually devoured as larvae, 775, 752, 758, and 805 Coccids respectively; while in the adult stage they ate 886, 819, and 902; the fourth one died a fortnight before the others, after consuming 558. Both larvae and insects were fed upon *Aulacaspis pentagona*. The larva first makes a hole in the scale and then either pulls the body out through the hole or pushes its own head into it. The adult insect very commonly lifts the scale up and pulls the body out. A ladybird will eat a young scale-insect in a second, but it takes 20 to 25 minutes to devour a fully developed Coccid. The number of eggs laid appears to be 16 to 17.

HERRICK (W. G.). **The Larch Case-Bearer.**—*Cornell Univ. Agric. Expt. Sta. Coll., Agric. Bull.*, no. 322, Nov. 1912, pp. 39-52, 15 figs.

The author describes this insect at length and its mode of attack. He states that there is but one brood in the year and that at the station three parasites, a Pteromalid, a species of the genus *Pachyneuron* and a Tetrastichinid had been bred out. He gives the following as having been bred from this insect in Europe:—*Bracon guttiger*, Wesm., *Microdus pumilus*, Ratz., *Campoplex nanus*, Gr., *Campoplex tumidulus*, Gr., *Campoplex virginalis*, Gr., *Anaphes* (?), *Entedon arcuatus*, Frst., *Entedon laricinellae*, Ratz., and *Pteromalus laricinellae*, Ratz. No practical method of control is known on forest trees over large areas, and on isolated ornamental trees arsenate of lead at the rate of 2½ lb. to 50 gals. of water sprayed on to the trees in April when the buds were just beginning to grow and again on May 5th, appeared to produce little or no effect. The following quotation from the report is specially interesting as showing the physical difficulties attending the effective use of these sprays:—

"In looking over the trees shortly after they were sprayed the poison was found to be invariably gathered in small globules at the bases of the leaves. The leaves of the larch are small, narrow, and glossy. The poison does not seem to stick to the narrow needles and consequently does not become well distributed

over the surface of the leaves. It is possible that a small quantity of soap added to the mixture would enable the poison to spread and stick better. Laboratory experiments with arsenate of lead gave very inconclusive results." (*Conf.* this Review, p. 46.)

"Lime sulphur," at the rate of 1 gal. to 8¾ gals. of water applied thoroughly to all the branches so as completely to cover the tree, was found to be really effective; the larvae being killed in their winter position.

PARROTT (P. J.) & SCHOENE (W. J.). **The Apple and Cherry Tree Ermine Moths.**—*New York Agric. Expt. Sta., Geneva, New York, Tech. Bull.*, no. 24, Nov. 1912, pp. 1-40, 9 pl., 1 fig. and map.

The discovery of *Yponomeuta padellus*, L., in the State of New York was due to the close supervision of foreign importations of nursery stock during the spring of 1909, which were instituted owing to the discovery of many nests of the brown-tail moth in imported material. The caterpillars in their webs were found on two occasions on cherry seedlings; practically all were destroyed, but sufficient were retained to enable six moths to be bred out which were identified by Dr. P. Marchal, of Paris, as *Y. padellus*, L. In spite of careful inspection at the port, caterpillars were found in 1910 on apple seedlings in various places. Very few were found on imported material in 1911 and still fewer in 1912, and it is hoped that the insect has not established itself in New York State. The authors devote much space to the distinctions between *Y. padellus* and *Y. malinellus*, and are of opinion that they are not separable specifically, though, in deference to existing opinion, they have treated them as distinct.

There is a native species of the genus *Yponomeuta*, viz., *multipunctellus*, Clem., which is common in Kentucky and feeds upon the leaves of *Euonymus atropurpureus*, Jacq. None of the well-known parasites of the moth have been reared from any of the material arriving in the United States on nursery stock, but a considerable number of specimens of a Tachinid fly, *Exorista arvicola*, Mg., were found on caterpillars taken from cherry seedlings in New York.

JONES (E. R.) & MACKIE (D. B.). **The Locust Pest.**—*Philippine Agric. Rev.*, vi, no. 1, Jan. 1913, pp. 5-22, 3 pl., 1 map.

The migratory locust is and has been for many years the most destructive insect pest of the Philippines.

In the term locust are included three, if not five, distinct varieties or species belonging to the genus *Acridium*. Some seem confined to Visaya, whilst others occur only in Luzon: the habits of all however are identical.

The losses from locusts in Visaya, the northern island of the group, during the latter half of 1912 amounted to 10,000,000 pesos (£2,083,000). Most of this damage resulted indirectly from one or two swarms originating in Bohol and extending over Cebu and Negros. It is believed that the swarms which recently infested Panay originated in the adjacent island of Guimaras.

In Mindanao there are vast areas of practically uncultivated land which form ideal breeding grounds, and it will not be possible for some time to come to eradicate the locusts from these areas, which the insects do not leave until they have attained sufficient vigour and numbers to necessitate a change of feeding grounds.

The authors then describe at length the well-known life-history of the locust. In the Philippines the average period of incubation of the migratory locust varies from 18 to 20 days. The young nymphs are known locally as "loctones" and these attack almost every kind of green herbage, though they frequently pass over potatoes, tobacco and beans, and hard substances such as sugar-cane; the stumps of shrubs and maize stalks usually escape. The young insects begin to move in a definite direction after the first day or two of their existence, covering only a few metres per diem, but by the time they are ready to move for the last time they will travel 3 or 4 kilometres between sunrise and sunset. The average time required for the nymph to reach maturity and acquire its wings is about 54 days, during which period it moults five times.

When all the loctones in a swarm have acquired their wings they usually remain for a few days longer in the immediate vicinity of their previous operations, sometimes apparently refusing to leave the old feeding grounds at all, provided there is a supply of food, but then after a few short local flights the entire swarm mounts into the air and travels, usually with the wind, at the rate of about 30 kilometres per day to a new breeding ground. Little is known of the conditions which influence the direction and extent of the flight of these swarms. Sometimes a swarm will return to the old ground several times before finally departing.

The mature insects give off a distinct odour, especially during and before the mating period, which may last for several days, and if the wind be favourable a swarm may be detected when it has alighted at night at a distance of 5 or even 8 kilometres.

The work of destroying the locusts is facilitated by the fact that the female lays the whole of her eggs in one cluster. As many as 4,000 to 5,000 egg-clusters have been found on one

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square kilometre of ground; but this does not mean that that number of females was to be found on that area at one time. These eggs would give rise to from 20,000 to 30,000 hoppers.

*Destruction of Eggs.*—Despite the most active operations the complete destruction of a winged swarm is practically impossible. The destruction of eggs in cultivated ground is a matter of great importance, and whenever practicable should be carried out as thoroughly as possible. The use of a plough with a mould-board is generally sufficient to bury the egg-masses to such a depth that when the loctones hatch out they are smothered in the earth, but with the ordinary Filipino plough it is necessary either to roll the land or ram it by hand. Where the plough cannot be used, digging out the eggs by hand has been found to give excellent results. Eleven persons in one place averaging about 125 litres of egg-clusters per diem.

*Destruction of Loctones.*—The principal defect of the simple pit and driving method is that the iron sheets or other materials required for constructing fences leading to the pit are not always readily available, and the carriage of large quantities of galvanised iron into the interior over bad roads to places where labour is scarce is impracticable. To remedy this, earthen dykes faced with banana sheaths (spathes) constitute a very effective method. The leaf blades of the banana should not be too small, otherwise the insects will simply devour the green portion of the leaf. These pit fences are erected about 20 metres in front of the advancing swarm; as many men and boys as the size of the swarm may require are then set to work to drive it with sticks and branches towards the pit. It is very important not to drive too fast, otherwise the swarm becomes a mere struggling mass and difficult to direct. Under ordinary circumstances after the construction of the fence and pit a swarm covering, say, 100 square metres or thereabouts, should be inside the pit within an hour from the beginning of the drive. Once in the pit the insects can be destroyed in the usual way.

On level ground the net method may be used to destroy the young hoppers with considerable success. The side of the net in contact with the earth should be kept straight by means of a straight stick, the upper part having a bow-shaped piece of wood attached to the rim to hold it wide open. In certain cases extra large nets drawn by horses may be used. The net should be constructed of coarse cloth or gunny sack. The winged insects, when roosting, may be captured in large numbers by the use of hand-nets which are swept over the bushes. It is perhaps unfortunate that the people in Sebu rarely use locusts for food, but in several provinces of Luzon, and to some extent in Leyte and Bohol, the Filipinos use nets to capture the locusts for food. Locusts are peculiarly cleanly insects, and the suggestion that they may carry germs of cholera and typhoid fever is absolutely negligible, especially if they are roasted or otherwise cooked before being eaten.

Rolling may be successfully used to crush the loctones on level ground. A straight smooth log 40 to 60 centimetres in diameter (16" to 24"), but the larger the better, drawn by cattle attached to either end, makes a good roller.

When the young hoppers are hidden in grass and brush on rough ground it is sometimes possible to cut the herbage over the infested area and set fire to it as soon as it is dry enough to burn. The destruction of the locusts is practically complete if there be a fair quantity of combustible material. The objection to the method is that a large amount of labour is required to cut the grass and that it can seldom be used in the rainy season. Another method is to use a burning jet of petroleum. An ordinary spray pump with the nozzle fastened to the end of a pole 6′ to 8′ long can be converted into a powerful burning torch, which is effective even in rainy weather. Any surplus oil which may escape continues burning on the insects or herbage. The objection to its use is the danger of accident in the hands of inexperienced operators, and the cost.

*Insecticides.*—These may be used against locusts in any stage, either as contact sprays or as poisonous solutions. Kerosene is one of the best sprays, but for general field work it is expensive, and the modification known as kerosene emulsion is much cheaper and very useful against young loctones.

The use of arsenical poisons is dangerous because:—(1) the Philippine planters are unfamiliar with them; (2) there is great danger of poisoning domestic animals; (3) many useful birds might be destroyed by eating the poisoned locusts.

In special cases, however, lead arsenate or a sweetened mixture of white arsenic may be used by experienced persons with good effect.

*Inoculation.*—A fungus (*Empusa grylli*) has been used with some success, it is said, in America against locusts, but it appears that it is only under very favourable conditions that the disease spreads with sufficient rapidity to destroy any large numbers, and the method cannot be recommended in consequence of its expense.

*Natural control.*—Heavy rain just after or during the moulting period, or at the time of hatching, is very effective against the young hoppers, and vast numbers are destroyed in this way. Sometimes heavy rains have been known to cause local floods which have carried sufficient silt on to land loaded with locust eggs, and has covered them to such a depth with an almost air-tight paste of fine mud that almost all the insects were suffocated as soon as hatched. It would appear also that excessive moisture in the soil during the incubation period considerably reduces the vitality of the young insect.

The authors found that four days' submersion in water destroyed 25 per cent. and six days' submersion the whole of the eggs in a cluster. They found also that if egg-clusters were thoroughly drenched with water daily the young loctones produced therefrom were very feeble, and that none of them lived more than eight days after hatching.

Among the predaceous enemies may be classed birds (including poultry), domestic animals, such as dogs and pigs, and insects. The cannibal habits of the locust are also important. They will eat injured or sickly individuals and this increases the efficiency of arsenical sprays, for the poison has been found to extend to the fourth successive individual. Of natural enemies, wild birds

are much the most important, and of these the most effective locust destroyers known at present are:—Luzon Shrike (*Otomela lucionensis*, L.), Carabao Bird (*Bubulcus coromandus*, Bedd.), Kingfishers, Variegated Curlew (*Numenius variegatus*, Scop.), Golden Plover (*Charadrius fulvus*), Button Quail, Jungle Fowl (*Gallus gallus*, L.), Yellow-billed Roller (*Eurystomus orientalis*, L.), and Bee-eaters (*Merops americanus*, Müll., and *M. philippinus*, L.).

It is probable that insect parasites exist, but the authors have not as yet been able to study this question thoroughly.

D'Arenberg (Prince P.). **A possible method of preventing the attack of *Pieris brassicae* on Cabbages.**—*Bull. Soc. Nat. d'Acclimat.*, 1st Jan. 1913, p. 18.

The author has made an observation that if hemp (*Cannabis sp.*) or broom (*Genista sp.*) be planted between the rows of cabbages, *Pieris brassicae* appears to avoid them, and he found that on placing two cabbages in a gauze cage with a tuft of *Cannabis* near to one of them and then introducing a large number of the insects, they avoided the cabbage near which the hemp was placed and collected on the opposite side of the cage.

It is a matter of belief amongst gardeners in certain parts of France that the odour of some plants is distasteful to certain insects, but precise observations are wanting. Mere strength of odour is certainly not distasteful, because the caterpillars of *Papilio machaon* eat the leaves of fennel with great avidity, and many Coleoptera and Hymenoptera are very fond of the flowers of the onion and of parsley.

Clément (— —). **Branches of Gooseberry attacked by the caterpillar of *Sesia tipuliformis*.**—*Bull. Soc. Nat. d'Acclimat.*, 1st Jan. 1913, p. 20.

The author exhibited before the Society a number of branches of the gooseberry attacked by the caterpillar of *Sesia tipuliformis*, which was lodged in some cases in the pith. This species does not push its excrement out of its burrow as is the case with *Cossus* and *Zeuzera*. The imago generally appears at the end of May. The female lays about sixty eggs in cracks in the bark or on branches of less than one year old, and the larva penetrates into the pith, burrowing a tunnel in which it passes the winter and which it enlarges at the end into a kind of chamber near the surface, where it forms a cocoon of silk and small fragments of woody fibre. Branches so attacked dry up and die in the following year. The pupal stage lasts about 18 days, and the appearance of the insect causes it to be mistaken by unskilled observers for a fly. It is found on the branches of the red and black gooseberry, and also upon the black elder, on sumac and hazel. No satisfactory means of combating this pest appears to have been discovered. Cutting the dead branches and burning them does not appear to be sufficient, because the part cut does not always contain the larva and it is possible to damage the bush by cutting too far back.

NOEL (Paul). **Les Ennemis des Épinards.** [The insect enemies of spinach.]—*Bull. Laboratoire Régional d'Entom. Agric., Rouen*, 1913, pt. 1, p. 13.

The author states that the larvae of the following Lepidoptera eat the leaves of spinach:—*Arctia villica*, Hb., from September to May; *Amphipyra tragopogonis*, L., and *Heliodines roesella*, L., in June.

WALDEN (B.). **A new Sawfly Pest of the Blackberry.** *Pamphilius dentatus*, **MacG.**—*Rept. Connecticut Agric. Expt. Sta., New Haven, Connecticut*, 1912, pp. 236-240, 3 pl.

The sawflies were collected by the author originally in 1910 and described by A. D. MacGillivray as a new species. Large numbers have been discovered in the original area in the succeeding years, the adults appearing from the latter half of May up to the middle of June. The eggs are laid in rows on the under side of the leaf, and in 1912 practically all were hatched by June 25th. The larva spins a few threads by which it draws a portion of the leaf over itself, forming an incomplete tube within which it feeds. When several eggs are laid on one leaf, the larvae collect together in one web. The habits of the insect are quite similar to those of the peach sawfly, *Pamphilius persicum*. The eggs, larvae, and adult insect are described, and the author adds that it is impossible to say at the present time whether the insect is likely to become a serious pest of blackberries, but that in the last two seasons it has spread over a considerable area. It apparently does not feed on any other species of plant. Black and red raspberries adjoining one of the infected blackberry fields were not attacked by it.

KIRK (H. B.). **The Walnut Bud-Moth.**—*Rept. Connecticut Agric. Expt. Sta., New Haven, Connecticut*, 1912, pp. 253-258.

The author noticed whilst studying the walnut weevil, nests of Lepidopterous larvae on the tips of the branches of Persian walnut (*Juglans regia*) and discovered that the larvae were burrowing into the buds and new shoots and causing nearly as much damage as the walnut weevil itself. These larvae were observed more than three years ago by Dr. Morris, but he was under the impression that they were the larvae of the walnut weevil, *Conotrachelus juglandis*. There are three generations in each season. The eggs are laid singly on the base of the bud and sometimes on the leaves, and hatch in 6 to 10 days. The larvae feed on the buds, leaves, and stems. The walnut weevil extrudes its "frass" by pushing it out from the egg punctures at the base of the petioles or along the stem, but never at the terminal end of the new shoot. In the work of the larvae which the author describes, the tips of the shoots die and the "frass" is retained, being afterwards used with the leaves to form a nest which contains most of the pupae and is the most conspicuous evidence of

the presence of this insect. The adults emerge two or three weeks after pupation. It was at first considered that the insect was *Acrobasis caryae*, Grote, to which the adults bear the closest resemblance; but it may prove to be an undescribed species.

MARCHAL (Paul). **Rapport sur les Travaux Accomplis par la Mission de l'Etude de la Cochylis et de l'Eudémis pendant l'année 1911.** [Report on the results obtained by the Commission for the study of *Cochylis* and *Eudemis* during the year 1911.] pp. 1-326, 2 pl., 60 figs.

*Biology, influence of environment and natural enemies.*—The author summarises the results of the work as follows:—The perfect insects of *Clysia ambiguella (Cochylis)* and *Polychrosis botrana (Eudemis)* do not live sufficiently long to effect the laying of their eggs unless they are in a position to obtain liquid food. Pure water appears to be generally sufficient. They are attracted by sugary material in a state of fermentation and drink sweet liquids greedily; but this substantial food only slightly prolongs their existence, which may be put at three weeks for the spring brood and about 12 days for the summer one. The functional activity of the insect requires moisture, and its love of moisture explains the abundant laying of eggs even during the day-time when the atmosphere is moist, *e.g.*, "when the sea-wind is blowing at Montpelier." For the same reason its localisation and its abundance in the moist parts of the vineyards, its attraction by water and the damage caused by it in vineyards which are regularly watered is explained. Inversely, dehydration of the body of the insect which is brought about by heat, drought and the absence of dew, accounts for the diminution or the practical suppression of the second brood which was observed in France in 1911 in numerous vineyards, and notably in Champagne. The number of eggs contained in the two ovaries averages 160 for *Clysia* and 120 for *Polychrosis*. The number of eggs actually laid in the course of the normal existence of the insects seems to be always considerably less than the numbers given, and rarely exceeds 60 or 80. The egg is laid on the flower-bud and no special point is chosen, though the first brood generally deposits its eggs on the bracts, the pedicels or on the bunches of grapes, or sometimes on the new wood at some distance from the bunches. In captivity the insects lay their eggs frequently on any object whatever, even on the glass walls within which they are confined.

The period of development of the egg varies with the temperature; in the case of the first brood of *Clysia* it is 7 days, and for the summer brood only 4 days. In the case of *Polychrosis* the period varies from 4½ to 8 days. Emergence always takes place from the upper surface of the egg, and the young caterpillar is very active and travels a considerable distance according to the position of the egg and the temperature conditions at the time; the first attack does not generally commence until several hours or even a whole day after emergence. In certain cases, which are however somewhat rare and which arise only in summer during very great heat, the caterpillar of *Clysia* emerges from the underside

of the egg and bores at once directly into the food material beneath.

The varied appetites both of *Clysia* and *Polychrosis* have been everywhere confirmed. They live and feed on the flowers and fruits of various trees (black currant, gooseberries, cornel, jujube, viburnum, wild plum, etc.) and also on a number of small plants such as *Galium mollugo* and *Silene inflata*. In the south, *Polychrosis* appears to be particularly fond of *Daphne gnidium*, whilst the caterpillar of *Clysia* can adapt itself to living upon the woody parts of certain plants. This capability of living on many plants other than the vine explains the spread of the pests from one vineyard to another even when there is a considerable intervening space free from vines, and enables us to understand the possibility of the persistence of the second brood of *Clysia* in spite of the total destruction of the harvest by mildew and by *Clysia* itself, such as happened in many vineyards in 1910.

Experience has shown not only that the number of eggs laid upon the bunches exposed to the sun is smaller, but that large numbers of these eggs so exposed never reach maturity, and that a large proportion of the young caterpillars which emerge are killed by the sun's rays. The excessive heat and dryness were the factors which chiefly contributed to the destruction of the second brook of *Clysia* in 1911, though they had much less effect upon *Polychrosis*. In Champagne the insects of the second brood suffered most, but in the Bordeaux district the effect was chiefly upon the caterpillars at the moment of their transformation and on the pupae. Numerous observations have been made on the natural enemies of both these moths. A parasitic Hymenopteron, *Copthora semblidis*, capable also of parasitising the eggs of various other insects, has been discovered in the eggs of *Clysia* and of *Polychrosis*. Details of the operations of these parasites are given in the body of the work as also the action of certain vegetable parasites.

*Treatment*.—In consequence of the period at which the Committee for the study of *Clysia* was appointed, the question of winter operations against the pest, which are very important, was not thoroughly studied during the year 1911, and is still under consideration. Chemical treatment by means of sprays during the period of growth and chiefly in spring-time remains the principal means of attacking these pests. The mixtures which have proved the most effective are preparations of nicotine, and particularly "bouillie bordelaise" combined with nicotine. The action of these preparations is at the same time that of a deterrent to the moth, a destroyer of the eggs and an external and internal poison to the caterpillars. Their efficacy can be defined as follows:—(1) 0·13 per cent. of the pure alkaloid will destroy a very large number of eggs by killing the embryo just as it is about to emerge, and this action will hold good for six or seven days after the application of the spray; (2) the young caterpillars which occur on bunches previously treated with a solution of nicotine of the same strength, die in great numbers even five or six

days after spraying, this being probably due to the ingestion of the liquid and the inhalation of the vapour given off; (3) nicotine solution of the strength 0·13 and 0·15 per cent. produces a great mortality amongst caterpillars when applied directly, especially if they are in an early stage of their growth: this direct action is much more powerful in the case of *Polychrosis* than in that of *Clysia*, and this appears to be true also of all external insecticides.

In order to obtain the best results, nicotine sprays should be applied with the idea of prevention, that is to say, during the period of oviposition and in a manner based upon biological observations and experience. The question of the most favourable moment for the application of the spray is of the highest importance; the experience of the past year has shown that the period when the best results can be obtained does not always correspond with that of the greatest abundance of caterpillars, but that the state of growth of the vine is a very important element in the question. The addition of substances which will increase the wetting power of the sprays such as soap and treacle greatly assists their efficacy. [*Cf.* this Review, p. 46.]

Arsenical mixtures (arsenate of lead) properly applied appear to be equally efficacious with the nicotine solutions, and those cases which have occurred in the past year in many districts in which the result was unsatisfactory can be explained by the defective conditions of application or from the mixtures having been badly prepared. Some authorities have denied the value of arsenical preparations because the poisoning of the caterpillars frequently takes place with great slowness, and because they act rather in reducing the numbers of the next brood. Arsenical mixtures poison through the alimentary canal and consequently the favourable time for preventive application is more limited and more difficult to determine than in the case of nicotine, because if applied too early they are useless. Further, they must be applied each time that fresh broods of the moths are observed to be produced and consequently their application must be extended over a longer period. These various considerations render the effects of arsenic more fugitive than those of nicotine preparations.

Barium chloride is a substance with which further experiments should be made in this connection. Its action is somewhat analogous to that of arsenic, and it has the advantage of not presenting the same risks of poisoning human beings. In the Bordeaux district very favourable results have been obtained, but burning of the leaves has been reported from many districts, even when it has been used in a relatively weak solution. It is possible that this may have arisen from impurities in the material used, or from the conditions under which the application was made. A further study of this insecticide is very desirable.

In order to complete the preventive action of nicotine, other insecticides which operate in a similar manner, that is to say as external poisons, have been tried during the past year. Amongst these, fresh pyrethrum powder mixed with soft soap may be considered the best against the first brood, whenever

the value of the harvest is sufficiently high to permit of its employment. If the cultivation of the plant is fostered in Northern Africa it will be possible to obtain the material in large quantities at a more reasonable price than at present. If for the greater number of vineyards the spring treatment does not afford a basis for an effective war upon the vine moths, the summer treatment is on the other hand far more fugitive in its results, except in the case of those vineyards where the harvest is of special value. Sprays, even with solutions of nicotine, cannot be made with too great care if the best results are to be obtained; arsenical spraying at this time of year should be altogether rejected, not only because of the risks to health, but because it is ineffective. We are thus left with the use of powders applied at the moment when the moths are about to take wing as the only chemical treatment of general application against the summer broods, but the technical details of their use require to be much further studied before any exact statement of their value can be made.

The destruction of the moths either by lantern-traps or by baits, which have been in use in the past year, is an excellent supplement to that of the use of insecticides against the caterpillars in the spring. The use of lantern-traps as practised in Champagne (either electric or acetylene lamps) is of no avail against *Polychrosis*, but is efficacious against *Clysia*, provided certain rules are observed in the arrangement of the luminous network and the disposition of the lamps. The maximum result is obtained during a succession of warm nights, and it may be allowed that where the value of the vintage is considerable, the lantern-trap method is practical and not over-expensive. It must not be forgotten however that this method involves the destruction of a great number of Hymenopterous parasites and other insects which are of great service, and this detracts somewhat from the value of the method. The system of destruction by baits has not thus far given results of sufficient consistency to permit of its being classed definitely amongst the methods of practical utility against the vine moths, but possibly when more is known of the details which are requisite in the use of these traps the method will be found to be of real service.

A large portion of the southern vine area, in consequence of the method of cultivation adopted, the strength of the fruit-bearing branches, the rapidity of the growth of the bunches and the low value of the vintage, does not lend itself to the application of sprays, nor of those preventive operations which require great care in carrying out. Over this area attention must be chiefly paid to the extensive application of winter treatment and of methods of cultivation which may serve as preventives, and the protection or the utilisation of parasites. In a general sense great hopes may be based on the organisation of what may be called "the natural war" against these moths, either by favouring the multiplication of parasites or by creating artificial foci of epidemics, but without neglecting the investigation of new insecticides or the perfecting of methods actually in use.

GREEN (Ernest E.). **Note on experiments with Mr. Beddewela's Termite Mixture.**—*The Tropical Agriculturist*, xl, Jan. 1913, p. 5.

Mr. Beddewela having invited a test of his Termite mixture, an appointment was made with him for the 11th October. On that date several termite nests (inhabited by *Termes redemanni* and *T. obscuriceps*) were opened under Mr. Beddewela's supervision, and treated with his mixture. This preparation is in the form of sawdust impregnated (according to the inventor) with certain medicinal oils. After the nests had been opened to a depth of a foot or eighteen inches, the mixture was sprinkled freely over the exposed surface. Some of the nests were immediately filled in with loose earth, others were left open. Mr. Beddewela's instructions were that the treated nests should be left open for several days (up to a week) before being filled in. Unfortunately, through some misunderstanding, the nests, which should have remained open were filled in and turfed over during the following two days. The inventor claims that the treatment will result in the death of the insects or—if not—in the discontinuance of their work at that spot. Most of the nests that were subjected to the experiment showed signs of renewed activity within a week of the date of treatment, and fresh earth-work was still noticeable after an interval of three months; but the colonies appear to be greatly weakened and the work is much less than might have been expected under normal conditions. If exposure for the specified time is an essential part of the treatment, there is a possibility that the practical recrudescence may be due to the too early closing of the treated nests. It will be necessary to repeat the experiment under more exact conditions and with proper controls.

CHAINE (J.). **Traitement des buis contre le *Monarthropalpus buxi*, Lab.** [Treatment of box trees against the attack of *M. buxi*, Lab.]—*C. R. Hebdom. Soc. de Biologie*, lxxiv, no. 3, 24th Jan. 1913, pp. 156-158.

The Cecidomyia of the Box (*M. buxi*, Lab.) is a small Dipteron, the larva of which attacks chiefly the common box tree, living in the interior of the parenchyma of the leaves into which it burrows.

In order to destroy the larva and protect the shrubs it is no use attempting to destroy the adult insect, as these, in consequence of their powers of flight, are very difficult to catch. It is also exceedingly difficult to kill the larvae and the nymphs, as they are so well protected in their burrows. The chief method available is to prevent the laying of eggs by the insect, and the author gives the following as the result of observations made by himself in gardens in Bordeaux.

This Cecidomyia will not lay its eggs upon dusty leaves. He has observed that the female approaches such leaves, circles round them in the attempt to find a suitable place for settling

upon and if one cannot be found she flies away. For this reason trees growing along the line of frequented roads are naturally protected against the insect. It would further appear that the nature of the substance spread upon the leaves in the form of dust has nothing to do with the refusal of the insect to lay its eggs. It is sufficient that the surface of the leaf shall be dirty.

The author experimented with sulphur and soot, but he is of opinion that any kind of fine dusty matter will answer the purpose. Not only is dust distasteful to the insect, but any kind of dirt; a sprinkling of the leaves with nicotine solution or even with soapy water was effective. The use of any kind of spray or powder is rendered a little difficult by the fact that to be effective it must be applied to the under surface of the leaves, and it is waste of labour to spray the trees in the ordinary manner. It is also useless to do this except just at the time when the insects are about to lay eggs, and he has found that flowers of sulphur applied in the following manner has given the best results:

The under surface of the leaves is carefully wetted with a spray apparatus, proceeding from below upwards, and immediately this is applied a pair of bellows containing flowers of sulphur and fitted with a piece of wire gauze at the end of the nozzle, is brought into operation. He found that the particles of sulphur attached themselves to the wetted leaves and adhered for a very long time after the water had evaporated. It is very necessary that this operation should be conducted with care, and thoroughly, because the female fly will certainly lay its eggs upon any leaves which may have escaped treatment.

The period of oviposition of this Cecidomyia lasts from two to three weeks, and it is thus advisable to repeat the operation once or twice during this period, as rain, wind and the growth of the leaves might render it necessary. In spite of all that can be done, some eggs will be laid and some leaves damaged, and the writer recommends that the trees should be examined about the end of January or the beginning of February, and that the leaves with galls on them should be removed by hand. No precaution need be taken to destroy the infected leaves because the larvae of *M. buxi* die as soon as the leaf on which they are living has been separated from the branch.

**Scale-Insects in the Seychelles.**—*Ann. Rept. Dept. Agric. and Crown Lands, Seychelles*, 1912, p. 9.

Great relief was experienced this year on finding, after the advent of the wet season, that natural parasites were keeping scale-insects under control. The artificial methods of control, such as spraying, etc., were too expensive to be adopted on a large scale, and in the meantime the scale-insects have been gaining ground all over the country. The period of violent attacks by scales is over in the more infested places, and it is to be hoped, now that the controlling parasites are in the ascendant, that the natural means of combating scales will be adopted at

once in other places. From 1905 to 1911 the periods of drought favoured the development of scales, and the first wet season in the islands for the last seven years is sufficient to cause the natural parasites to appear.

The green scale (*Lecanium viride*) is attacked by a white fungus on coffee and Funtumia rubber; the black scale (*Lecanium nigrum*) on Hevea rubber by a reddish brown fungus (a species of *Hypocrella*, according to Petch); the star scale (*Vinsonia stellifera*) on gutta-percha by a greyish white fungus; the mealy bug (*Icerya seychellarum*) on lovi-lovi (*Flacourtia inermis*) by a red-headed fungus.

These fungus parasites have been found at 800 feet above the sea, although the white fungus on *Lecanium viride* and the reddish brown fungus on *Lecanium nigrum* are present here and there in the low country. No time should be lost in propagating them all over the Archipelago. This is being done already by one or two planters by tying leaves and twigs infected with fungi to other trees attacked by scale-insects which are not parasitised.

**Injurious Insects of St. Lucia.** *Rept. Agric. Dept., St. Lucia*, 1912, p. 11.

*A Tobacco Insect.*—A trial plot of tobacco in the Soufrière districts was practically destroyed by a leaf bug of the family CAPSIDÆ, some of which are serious pests. The plot was visited and remedial measures were recommended, but the cultivation was abandoned.

*Scale-Insect Fungi.*—A fungus found growing on leaves of Java plum (*Eugenia jambolana*) was reported by the Mycologist to be the same as one found on the leaves of the star apple (*Chrysophyllum cainito*) in Dominica, and identified at Kew as the conidial stage of *Hypochrella oxyspora*, Massee. The fungus is regarded as an important one, as it is probably parasitic on scale-insects, like several other species of the same genus.

The fungus *Ophionectria coccicola*, commonly known as the white-headed fungus of scale-insects, that plays such an important part in the control of these pests in Dominica, has been discovered to occur in St. Lucia. It was first recorded here as occurring on scale-insects on an orange tree in the heights of Vieux Fort. It has since been found at Soufrière and efforts are being made to spread it.

*Insect Pests.*—What appears to be the burrowing scale (*Howardia biclavis*), on the stems of young *Castilloa elastica* plants in the nursery, was found to be parasitised by the red-headed fungus (*Sphaerostilbe coccophila*). Other insects that have been collected and submitted to the Head Office for investigation are: lace bugs, found on the leaves of the egg-plant and probably identical with *Corythaica monacha*; a fly on lime trees; and a red-coloured mite parasitic on the common house-fly.

**Parasitic Fungi on Scale-Insects in Dominica.**—*Rept. Agric. Dept., Dominica*, 1912, p. 12.

Dominica, as a whole, continues to be remarkably free from any serious attacks of scale-insects and the parasitic fungi controlling them continue to do most excellent work. The observations made during the year have brought to light two interesting facts. First, that the white-headed fungus (*Ophionectria coccicola*) is only found on the newer estates in the interior and that it is not found on the older estates by the coast, and further that the red-headed fungus (*Sphaerostilbe coccophila*) is found to be parasitic on the West Indian red scale (*Aspidiotus sp.*).

The white-headed fungus, which in the interior is perhaps the most vigorous of all the parasites, has possibly not been introduced on these older estates and efforts will be made during the present year to do this, and to spread this fungus on the mussel scale (*Lepidosaphes sp.*).

Theobald (F. V.). **The Aphides on Mangolds and Allied Plants.**—*Jl. Board of Agric., London*, xix, no. 11, Feb. 1913, pp. 914-922, 1 pl. and 3 figs.

This paper is a continuation of one published by the author in the Jl. of the Board of Agric., Sept. 1912.

**The Boat-Gall Aphis** (*Aphis atriplicis*, L.).—This is a green Aphis producing boat-shaped galls on the leaves of cultivated and wild Chenopodiaceae, including *Beta*, *Chenopodium* and *Atriplex*. It affects the upper sides of the leaves and settles mainly on the mid-rib. The effect of the punctures made by the insects is to cause the leaves to curl upwards and eventually to enclose the insects entirely. During the first week in August, according to Hayhurst and Connold, the winged viviparae leave the galls in great numbers and migrate, so that in the middle of August the galls are practically empty. The ova are placed on the calyces and seed-capsules, and on the small leaves of the upper branches, and a few in the galls. It is thought that the white goosefoot (*Chenopodium album*) when introduced into America carried this Aphis with it.

The food-plants recorded for this species are:—*Chenopodium album*, *C. murale*, *C. urbicum*, *C. quinoa*, *C. hybridum*, *C. calcarium*, *C. polyspermum*, *Atriplex portulacoides*, *A. patula*, *A. littoralis*, *A. angustifolia*, *A. latifolia*, *A. hortensis*, *A. babingtonii*, and *A. hastata*; cultivated beet, sugar beet, and mangolds.

*British Localities.*—Cambridge, Kent, Sussex, Guernsey.

*Foreign Distribution.*—Sweden, Belgium, Germany, Hungary, Italy, and the following States in America: Nebraska, Illinois, New York, Missouri, Kansas, Colorado, Michigan, and Oregon. Gillette (Journ. Eco. Ent. iii, 1910, p. 405) describes it as a very abundant species, generally distributed in Colorado upon both sides of the mountains, and up to fully 7,000 feet altitude.

**The Green Mangold Aphis** (*Rhopalosiphum betae*, sp. nov.) is very common on beets, mangolds and some wild Chenopodiaceae. The author originally took it to be Schrank's *Aphis chenopodii*.

Both Kaltenbach and Schouteden in recent years, however, place Schrank's species as a synonym of Linnaeus' *atriplicis*. The author considers himself obliged, after comparing the description, to do the same, and hence the Green Aphis, so abundant on beets and mangolds in 1911, must be described as a new species.

**The Short-syphoned Mangold Aphis** (*Aphis brevisiphona*, sp. nov.). A few specimens of this Aphis were found by the author with *R. rumicis* and *R. betae*, and the characters are sufficiently marked in his opinion to show it to be a distinct species.

**The Teasel Aphis** (*Aphis ochropus*, Koch).—This Aphis was described by Koch and also by Kaltenbach as found on the teasel (*Dipsacus sylvestris*) and on *Chenopodium*. The author has taken it once only on dock, and never on Chenopodiaceae.

*Remedial and Preventive Measures against Aphids.*—Enquiries were made of the author in 1911 in consequence of local outbreaks as to the best methods of clearing Aphis from root-crops. Nicotine wash was out of the question as being too expensive, and trials were made with soft soap and quassia and paraffin jelly, with good effect. It was found that when the wash was discharged with considerable force, a large quantity rebounded from the roots to the underside of the leaves with excellent results. The proportions used were:—soap 8 lbs., quassia 5 lbs., water 100 gallons.

Spraying for the attack of "Collier" or "Black Fly" on broad beans in the garden is certainly advisable, if the insect has been allowed to spread downwards, and this may be done with much success in the field with knapsack sprayers.

To prevent infestation of mangolds, the primary host plants, especially wild poppies, must be destroyed. This is not always easy, particularly on wild places along the coast and on waste hillsides where poppies flourish, but it should be attempted. This Aphis winters on the spindle tree (*Euonymus*) both in Europe and America, and it is certainly advisable to destroy all such in hedgerows and woodlands. Docks (*Rumex*) must also be dealt with, as the Aphids winter on these plants also.

The attacked tops of broad beans should be nipped off as soon as any colony is seen, together with the sound tops, for the young lice produced by the winged females do not seem to be able to flourish on anything but the tender top growths.

Bingley in 1820 gave the advice, which in the author's opinion is very sound, that it would pay the farmers in any given district to compensate any particular person whose beans were attacked to have them completely destroyed.

HUNTER (W. D.), PRATT (F. C.), & MITCHELL (J. D.). **The Principal Cactus Insects of the United States.**—*U.S. Dept. of Agric., Bull.* 113, Dec. 1912, pp. 1-71, 7 pl., 8 figs.

Cactus plants of the genus *Opuntia*, which is indigenous to America, have been cultivated and transported to remote parts of the globe where they have been planted for the purpose of furnishing food for the Cochineal insect, and except in so far as this insect is concerned, other species feeding upon *Opuntia*

have until recently been rather of scientific than of practical significance. In the early days any insect that injured the food of the Cochineal insect was of importance, but with the decadence of the Cochineal industry this cactus became a nuisance, where the "tunas" were not utilised as food; thus a once valuable plant became a weed and the other insects which fed upon *Opuntia*, instead of being considered as pests, rose to the rank of benefactors, inasmuch as they destroyed a weed. In fact, in South Africa and Australia the encouragement of the insect enemies of prickly pear has been proposed as a feasible means of reducing the number of plants. In the United States the prickly pear has frequently prevented the starvation of large herds in times of drought, although the plants occupied great areas which would otherwise have furnished a good supply of forage. Investigations on the feeding value of prickly pear were begun some years ago by Mr. D. Griffiths of the Arizona Agricultural Experiment Station and it was found that this was exceedingly high. The great practical difficulty of using the plant for forage was the spines, but this has been eliminated by singeing them or by running them through machines which chop them into small pieces. The same investigator has also discovered that the plant responds readily to cultivation and that it is quite easy to double its productivity. Thus this cactus has once more become useful, and the question of insect injury to what is now a farm crop becomes one of serious consequence.

The authors review briefly previous work on pests of the prickly pear, and they classify the insects frequenting the plant as follows: (1) those which injure the plant, 92 species; (2) parasites of these injurious species, 28; (3) scavengers, 73; (4) flower visitors, 40; (5) other species only incidentally associated with the plant, 91; total, 324 species. They further classify the injurious species as: (1) attacking the roots or stems, 12; (2) attacking the joints, 27, of which 11 feed inside and 16 destroy the outer portion. Only a few of those found in the blooms are injurious, others being distinctly beneficial, as assisting fertilisation. There are 13 species which injure the fruit.

Of the insects affecting the roots and the stems the authors refer specially to 8 species of the Cerambycid genus *Moneilema*, which live on the plants all through the season and do much damage by gnawing the edges of the newly formed joints. This injury however is trifling in comparison with that done to the stems and roots by the larvae, which bore wide galleries in the stem and travel about the plant from one part to another in order to obtain a better supply of food. There is only one generation in the season and the adults generally appear in April, May and September. The injury can always be detected by the large numbers of joints and stems that have fallen to the ground, and much may be done to stop their ravages by raking together and burning this waste. The authors strongly recommend hand-collection of the insects, as they are large and wingless and not at all difficult to catch; otherwise, powdering the young joints with arsenate of lead is advised, as this will in addition serve to control at least one other insect pest.

Young plantations are often seriously injured by a cut-worm, *Chorizagrotes soror*, Smith. Wherever this insect is abundant it is easy to protect the plants by soaking the portions used for propagation for a few minutes in a solution of arsenate of lead, or the section to be planted may be dusted with the powdered arsenate at the time of planting. Three species of COCCIDAE, or scale-insects attack the roots, but they have not been observed to do any damage of serious consequence.

*Chelinidea vittigera*, Uhler, is one of several insects which do serious damage by attacking the joints externally. It is a yellowish bug resembling the common squash bug, *Anasa tristis*, De Geer. The insects are gregarious and are chiefly nocturnal in their habits. The first indication of attack is light circular spots on the joints. During the winter the insects are to be found in quantities in a dormant state under prostrate joints. The species and its congeners are restricted to cactus plants, and are by far the most important enemies of cactus occurring in the United States. As a result of the attack the plant is weakened and soon falls over, and when the bugs are numerous the fallen plants have the appearance of having been battered down by heavy hail. More frequently however the joints dry up completely or become the breeding places for many species of scavenger insects found associated with *Opuntia*. When the plant is weakened the bugs migrate to others and continue their work of destruction. It has been observed that joints on which the bugs have fed and which have not shown any special damage during the season, are the first to be injured by frost in the following winter, and this injury may set back the growth of the plants as much as two years. The bug is also suspected of disseminating a fungus disease, *Perisporium sp.* The life-history of the bug is briefly as follows: It breeds continuously throughout the summer and autumn, but no definite number of broods can be determined. The eggs are generally deposited on the spines to the number of about 40 per female. The nymph undergoes five moults, the stages lasting respectively 7, 4, 4, 12 and 14 days. When the temperature falls to 45° or thereabouts the bugs begin to hibernate, creeping under fallen joints, grass and the like, in the immediate vicinity of the plants. They do not appear to travel far from the plant on which they are produced. Two other species of *Chelinidea*, *C. tabulata*, West., and a smaller undescribed species have been found. They are by no means so common as *C. vittigera*, but might easily become serious pests. The best method of control is to collect and burn the trash on which the insects are found during the winter, after raking it into piles. The gasoline torch which is found on all plantations where the cactus is used for forage, is an economical and effective method of destroying the early stages.

The next most important cactus pest is *Mimorista flavidissimalis*, Grote, a Lepidopterous insect of the family PYRALIDAE, the larvae of which feed invariably on the upper edge of young joints under a silken web. It is more restricted in its range than *Chelinidea*. In Texas it is found from Hallettsville and San Antonio southward. West of San Antonio it is rare, and it has been taken at Tucson, Arizona. In the areas in which it is

common it is said to be by far the most injurious cactus insect. A generation is produced in about 30 days, and 4, 5 and even 6 generations in the year are possible. It confines its attention to young plants and it has been frequently observed that 50 to 75 per cent. of the new growth has been destroyed over considerable areas. Seven eggs are laid, all on the upper edge of the joint. The first indication of attack is the exudation of sap from the joints. If this be removed a small hole becomes visible, and as the larvae develop the discharge of sap from the plants becomes mixed with silk, trash and excrement. Sometimes the joint recovers, though always deformed: in most cases, however, decay sets in, the joint turns black and drops off. The important features of the attack of this insect are the large number of broods and the fact that it is confined to new growth, the result of which is that at the end of a season there are no more joints than there were the year before. A Hymenopterous parasite of this species, *Eiphosoma texana*, Cresson, has been reared. It does not appear however to be sufficiently abundant to exert much control over the pest. Arsenate of lead has been found very effective against this pest if applied as soon as the attack begins in the spring. In this way the majority of the first brood will be destroyed. If the first brood should not be reached in time, every effort should be made to apply the arsenate in ample time for the second brood.

A Halticid beetle *Disonycha varicornis*, Horn, frequently occurs in such numbers as to cause the death of plants of *Opuntia leptocaulis* and *O. arborescens*. It has never been found on the broad-leaved species of the genus. A Capsid bug, *Stylopidea picta*, Uhler, though not a true cactus insect, is occasionally found in large numbers on *Opuntia*, but unless the insect be unusually abundant the damage done is not great.

One of the Cochineal insects, *Dactylopius confusus*, Ckll., is often found in large masses on *Opuntia*. The author gives a brief history of the Cochineal industry in southern Mexico. The maximum production was for several years, about 1876, more than 7 million pounds, but since the discovery of aniline dyes it has declined very greatly. This insect is an important pest of *Opuntia*, but it is preyed upon by eight species of Coleoptera and three of Lepidoptera as follows:—COLEOPTERA: *Exochomus latiusculus*, Casey; *Exochomus marginipennis*, Lec.; *Cycloneda munda*, Say; *Chilocorus cacti*, L.; *Hyperaspis trifurcata*, Schaef.; *Hyperaspis cruenta*, Lec.; *Scymnus loewi*, Muls.; *S. horni*, Gorh. LEPIDOPTERA: *Laetilia coccidivora*, Comst.; *Zophodia dilatifasciella*, Rag.; *Saluria ardiferella*, Hulst.

The best means of control when the insects are not required for commercial purposes is to remove the masses on the joints by means of a very stiff brush or to burn them with a torch. The extensive secretion of the insect greatly interferes with the application of insecticides.

The Pyralid moth, *Melitara junctolineella*, Hulst, and other species of the genus are true cactus insects. The eggs are laid in masses of as many as 30 together, and there appears to be only one brood each year. As soon as the larvae hatch in the spring they begin feeding on the surface of the joints and in a few days

make their way to the interior. All observers are agreed that never more than one or two larvae are found within a joint; this is remarkable in view of the fact that the eggs are deposited in such large numbers. The larvae have never been found travelling, and it is believed that their cannibal propensities afford at least a partial explanation, but their work also largely involves their own destruction as they become involved in the repair tissue formed by the plant. The joints swell to as much as four times their normal thickness, and the injury is often made greater by a number of scavengers, principally Dipterous. A large amount of the damage is done by the larvae passing through the stem from one joint to another, and in this way one may kill several joints. The insect cannot be said to be extremely abundant, but it is found throughout the cactus area, and the total damage done is considerable. Certain differences in habit which have been observed lead to the belief that there may be more than one species involved. The Tachinid parasite of this species, *Phorocera comstocki*, Will., is common. It has been reared from material collected throughout the cactus area. The only method as yet found useful for keeping the pest in check is the use of the torch.

The following are also described as attacking joints internally: *Melitara dentata*, Grote, *M. fernaldialis*, Hulst, *Gerstaeckeria porosa*, Lec., *G. clathrata*, Lec., and the Tineid moth, *Marmara opuntiella*, Busck. Of species injuring the blooms there is only one which is of any consequence, *Trichochrous* (*Pristoscelis*) *texanus*, Lec., a Scarabaeid beetle. In certain places this has at times been found in such abundance that a great majority of the plants ceased to bear fruit. The Coreid bug, *Narnia pallidicornis*, Stål, is important as a pest only when the fruits are desired for food. On account of its gregarious habits and its location on the parts of the plant easily reached by a gasoline torch, its control is not difficult. Three other species of the genus are also described as feeding on the fruit, and also four species of CECIDOMYIIDAE. The 73 species of insects described by the author as scavengers live for the most part on the joints after these have been killed by other insects or when they have been blown off. Many however breed in the living joints, obtaining entrance through the burrows of *Moneilema*, *Melitara* and other forms, increasing the diseased condition caused by the first comer. The most common of these is a Syrphid fly, *Copestylum marginatum*, Say, and two species of *Hermetia*, *H. chrysopila*, Loew, and *H. hunteri*.

The report concludes with a list of insects directly or indirectly injurious to, or associated with, *Opuntia* and a lengthy bibliography.

**Insect Pests in the Virgin Islands.**—*Agric. News, Barbados*, xii, 1st Feb. 1913, pp. 42 & 43.

This is an account of the entomological observations made in the Virgin Islands by Mr. A. J. Tempany, of Antigua. At the time of his visit continued heavy rains had followed prolonged

drought and insect life was very abundant. The cotton caterpillar, *Alabama argillacea*, was found abundant in Tortola and Virgin Gorda. The attack was so severe that for the first time it was found necessary to organise the destruction of the pest by insecticides; natural enemies, which had previously exercised a fairly efficient control, having failed on this occasion. The conditions under which cotton is usually grown in the Virgin Islands are such that the areas cultivated consist largely of isolated small plots surrounded by high bush; this the author regards as favouring natural control. The "black witch" bird, *Crotophaga ani* (*see* p. 36), appears to exercise considerable control over the cotton pests and there is a large mason-bee which is also predaceous, as well as certain species of *Polistes*, known as Jack Spaniards, possibly *P. fuscatus instabilis*, which is common in the Leeward Islands, but probably not the same species as that which has proved a valuable enemy of the cotton worm in St. Vincent and Barbados (*P. annularis*). Other pests of cotton were not specially abundant, but some damage was recorded by cut-worms and also a small gray weevil differing apparently from that which was responsible for similar damage in Antigua. Limes were on the whole remarkably free from scale-insects. The common species found are the purple scale, *Lepidosaphes beckii* (*Mytilaspis citricola*), the green scale, *Coccus viridis* (*Lecanium viride*), and the white scale, *Chionaspis citri*. The scale-fungus *Cephalosporium lecanii*, was observed however to be present in great quantity, parasitic on the mango shield-scale and other Lecaniums in and around the Experiment Station. A yellow weevil attacks the leaves of lime trees and does considerable damage. This is stated to be probably a species of *Diaprepes*, quite different from the root-borer of sugar-cane in Barbados (*D. abbreviatus*) and resembling *D. spengleri*, though apparently distinct from it. The grub of *D. spengleri* is reported to attack the roots of orange and other citrus trees in Porto Rico; it also occurs in St. Vincent, where however the habits of the grub do not seem to be known. In Virgin Gorda sweet potatoes were found to be very badly damaged by the sweet potato hawk-moth, *Protoparce cingulata*; while at the Experiment Station some damage had been done to arrowroot by the arrowroot worm, *Calpodes ethlius*.

MIDDLETON (M. S.). **Injurious Insects in Kootenay.**—*Proc. Br. Columbia Entom. Soc.*, 1912, pp. 17-19.

This district is stated to be remarkably free from insect pests, and none are serious. In the past year *Eriosoma* (*Schizoneura*) *lanigera* has not made its appearance in the district, though *Aphis mali* showed itself in great numbers early in the spring, but did not spread to any extent. Spraying over Green Aphis with lime and sulphur mixture is said to have had little effect in destroying the eggs on the branches. The Aphides were hatching out and spreading over branches which were yellow with lime and sulphur. Black Leaf 1-70 gave good results when thoroughly applied, but the newer mixture, Black Leaf 40, was less satisfactory.

A Leaf-miner (*Tischeria*) was fairly abundant in orchards near the timber line. This insect does so little damage that no means of control are practised. The fly known locally as the "salmon fly" or "cicada" did much damage to young trees along the Columbia River by laying its eggs in slits made in the new shoots, causing them to snap off later in the wind.

"Climbing cutworms" were exceptionally troublesome, as many as sixty being sometimes taken on one small tree. This was brought about by a catch-crop of clover having been ploughed in in the spring; in many instances every single bud was eaten. Poisoned bait—100-lb. bran, 1-lb. Paris Green, and 2-lb. sugar—was tried without result, but another mixture—50-lb. bran, 1-lb. Paris Green and 3-lb. sugar—was applied with good results, the worm seeming to prefer it to the buds. The mixture should be applied fairly dry and crumbly and should be sweetened according to the plants upon which the larvae are feeding.

The author gives a warning against the use of Paris Green on young and tender plant growth. If applied too close to the trunk it appears to have a girdling effect on the plant. In a number of places young trees were completely girdled from no other cause. Larger trees do not suffer in the same way, but it is reasonable to suppose that even on matured wood the effect of Paris Green is not beneficial.

The California tortoiseshell (*Vanessa californica*) was found in such large numbers on the Ceanothus along the Columbia, Slocan and Kettle Rivers that fruit-growers became alarmed. Fortunately the larvae did not leave their proper food-plants for cultivated trees. The author thinks that they must have been very heavily parasitised, as the second brood, which was to be expected in the latter part of the summer, was exceedingly small.

Brittain (W. H.). **Beneficial Insects.**—*Proc. Br. Columbia Entom. Soc.*, 1912, pp. 32-38.

The writer reviews briefly our knowledge of the parasites of injurious insects, and the results obtained in the United States and elsewhere from their importation. He remarks that many noxious weeds are subject to the attack of insects to such an extent that these insects must be considered as beneficial. He wished to collect a supply of seeds of the common Canada thistle and found it exceedingly difficult to obtain a sound seed over a large area in consequence of the flower heads being attacked by a small maggot. Among beneficial insects he cites the milkweed butterfly (*Anosia plexippus*), thistle butterfly (*Pyrameis cardui*), and the purslane hawk-moth (*Deilephila lineata*).

Cunningham (T.). **Inspection of Fruit for Pests.**—*Proc. Br. Columbia Entom. Soc.*, 1912, pp. 50-71.

The author, in the course of an address to the British Columbia Entomological Society, says that British Columbia has a reputation to-day of being the only Province in North America that is

free from the Codling Moth, San José Scale, Gypsy and Brown-tail Moths, and several fruit-flies.

He quotes at length examples of quarantine orders by various States of the Union against the following insects: *Aleurodes citri*, *A. nubifera* (on citrus trees); *Phytonomus posticus* on alfalfa; *Sanninoidea pacifica* (Western Peach-tree Borer); *Anthonomus grandis* (Cotton-boll Weevil); *Chrysomphalus aurantii* (California Red Scale), *Chrysomphalus aurantii* var. *citrinus* (California Yellow Scale), *Laspeyresia* (*Carpocapsa*) *pomonella* (Codling Moth), and the scale-insects *Aspidiotus perniciosus*, *Aspidiotus rapax*, *Saissetia oleae* and *Lepidosaphes ulmi*, and *Anarsia lineatella* (Peach Worm).

A case is cited in which an isolated outbreak of the Codling Moth, though on a very small scale, was stamped out by the purchase and immediate cooking of all the apples in three orchards with steam at a pressure of over 120 lbs. on the inch, and it is stated that this method has been introduced into Australia and New Zealand for dealing with all imported fruit which is known to be infested. The author points out that the attack of Codling Moth referred to probably arose from nursery stock imported from Oregon, from certain fruit-houses known to be badly infested.

The system of purchasing and destroying fruit cannot be continued on account of the expense, but it is hoped that the spraying of suspected orchards with arsenate of lead, two or three times in the season, under Government inspection, may prove effective against any possible further outbreak.

Railway cars have been found to contain numbers of cocoons of the Codling Moth, and methods by which these cars can be properly disinfected are under consideration, though no definite plan has been arrived at, the problem being somewhat difficult of solution.

DAY (G. O.). **Notes on *Schizura unicornis*, Smith and Abbot.**—*Proc. Br. Columbia Entom. Soc.*, 1912, pp. 40-41.

The writer describes the caterpillar and says that they are found on apples, plums, apricots and other plants, and eat a good many leaves without leaving much trace of their ravages. They are not very plentiful or likely to become a pest. The larvae are found in September, and the moths appear in the following June.

LANE (W. H.), Asst. Inspector of Fruit Pests. **Carbon Bisulphide Fumigation.**—*Proc. Br. Columbia Entom. Soc.*, 1912, pp. 28-31.

Many hundreds of tons of imported rice and grain are treated at the Vancouver and Victoria fumigating stations every year as follows:—The sacks containing the rice or grain are stacked two or four deep on the floor of the fumigation chamber. Soup-plates are placed at equal distances on top of the sacks, all windows and doors are sealed, and the amount of liquid carbon bisulphide

necessary to the cubic space measurement of the chamber is distributed in equal quantities in each soup-plate. The chamber is then closed and sealed for thirty-six hours.

For every ton of grain 1-lb. of carbon bisulphide is required, and it has been found that 36 hours' exposure to the vapour will kill any insect confined in grain, roots, or fruit.

When Japanese brown rice was first imported into Vancouver the question arose as to whether the carbon bisulphide fumes would affect the flavour. To test this, two separate lots of rice, one which had been treated and the other not, were cooked in separate vessels, and submitted to the Japanese importers and others to taste. They failed to distinguish between the two. Similar results were obtained with pineapples, oranges, apples and pears. If perfectly dry, the germinating power of grain, seeds and bulbs is not injured.

In the use of carbon bisulphide against orchard pests certain precautions must be taken, otherwise the trees may be killed. Some years ago the fruit-growers in California began using carbon bisulphide extensively against *Sanninoidea opalescens* (Peach-tree Root-borer). Numbers of trees were killed outright and others injured. The plan adopted was to make a trench about 6″ deep around each tree, pour in one or two ounces of the liquid and fill in the trench with soil. In twenty-four hours the borers were dead, and the soil round the tree was then removed and the space well aired before replacing it. Unfortunately great carelessness was shown in allowing the liquid to touch the bark of the trees, and this frequently happened also in consequence of the soil being too wet at the time of application. The author says that he once saw ten acres of seven-year-old prune trees on almond stocks totally destroyed by carelessness in the application of carbon bisulphide.

According to the author, 36 hours at least of exposure is required to kill the eggs of the Mediterranean Flour Moth.

The case is recorded of a car-load of beef scraps from Chicago, which was alive with predaceous beetles of all kinds, being satisfactorily treated with carbon bisulphide.

Wilson (T.). **Insect Pests in Vancouver.**—*Proc. Br. Columbia Entom. Soc.*, 1912, pp. 5-8.

The unusually wet season of 1912 has prevented the propagation of many pests throughout the Fraser Valley and the surrounding district. The attack of the caterpillars of *Malacosoma erosa* was confined to the west and south-west of the mainland, comprising part of the Municipality of Surrey and part of the Delta as far as Blaine on the American boundary. In the town of Blaine these caterpillars were a great nuisance, crawling over fences and into open doors and windows, and all along the shore of Simiamhoo Bay the orchards and all the deciduous trees were completely stripped of leaves. Further inland many of the larvae, although plentiful, seemed to dry up and did no harm, and nearly all were attacked by a parasite as yet not determined.

A bad, though isolated, attack was reported around Agassiz, which however did not extend beyond a mile east of the town. The author remarks that American authorities have confirmed his observation that this caterpillar never attacks pear trees.

*Schizura concinna* (Red-humped Apple-tree Caterpillar) did great damage in the drier parts of the Fraser Valley. It was quite common to see four or five caterpillars on one leaf. The author found that some were attacked by an Ichneumonid parasite, *Limnerium* (*Limneria*) sp.

*Hyphantria textor* (Fall Web-worm). This caterpillar appears to attack and destroy the leaves of all deciduous trees. Ornamental trees, apart from the actual damage to the leaves, are rendered unsightly by the filthy webs full of the remains of the caterpillars and their excreta.

*Spilonota* (*Tmetocera*) *ocellana* (Bud-moth) was very common, and injured apple, plum and cherry trees, but especially the Italian prune, the output of which was said to have been reduced by one-half.

*Psylliodes punctulata* (Hop Flea-beetle) was fairly plentiful at Chilliwack, but did not do so much damage as usual. This insect will eat nettles, clover, chickweed, tomatoes, beet and other farm crops.

In the Nicola country *Chionaspis pinifoliae* did great damage to the bull pines (*P. ponderosa*), some of the trees being so seriously attacked as to be powdered over from top to bottom with "frass."

ANDERSON (E. M.). **Injurious Insects in Victoria, British Columbia.**—*Proc. Br. Columbia Entom. Soc.*, 1912, p. 9.

The writer states that though the Tent Caterpillars did a large amount of harm in the past year in the Victoria district, over 60 per cent. of a very large number examined were found to be infested with the ova of a small ichneumon fly, which it is hoped will cause a great reduction of their numbers this year. *Neophasia menapia* (Pine White Butterfly) was curiously absent in the outskirts of Victoria; in places where in previous years thousands were to be seen, hardly a single specimen could be procured. *Therina* (*Ellopia*) *somniaria*, Hulst, did not cause so much damage to oaks as in previous years.

GREEN (Ernest E.). **Injurious Insects in Ceylon.**—*Rept. Govt. Entom. Dept. Agric., Ceylon*, pt. iv., 1911-12, pp. 2-5.

*Tea Pests.*—*Xyleborus fornicatus* (Shot-hole Borer) is still the principal subject of inquiry. There has been no marked increase in its range. In the Madulkele district it was found to be spreading from a native-owned estate where the prunings had not been destroyed. The Dikoya and Maskeliya districts and the greater part of Dimbula still remain free, and may continue to escape

infection if care is taken to avoid the introduction of tea plants grown in infected localities. There is no doubt that the pest would never have established itself so widely had it not been for the constant employment of outside nursery plants instead of seed. If all plants for new clearings were grown on the place where they were required, there would be little or no danger of the introduction of the borer, for seed is never infested.

At the instance of certain districts, Shot-hole Borer has been proclaimed as a pest under the Plant Pests Ordinance of 1907.

The question of the utility of the predaceous beetle (*Clerus formicarius*) as a possible enemy of Shot-hole Borer has been finally set at rest by the receipt of a few living larvae of that insect. It was at once apparent that these larvae were several sizes too large to be of any use.

*Capua coffearia* (Tea Tortrix) has been reported from several districts, but trouble from this pest has been much less general than in previous years. This may be due, partly to a greater amount of rain during the early months of the year, which favours disease amongst the caterpillars, and partly to better cultivation.

There has been a marked scarcity of complaints of other caterpillar pests. No notice was received of Nettle Grub (LIMACODIDAE). Isolated outbreaks of Red Slug (*Heterusia cingala*) and *Caradrina reclusa* have been reported from the Kalutara and Deniyaya districts respectively. Two instances of minor attacks of the Small Tussock caterpillar (*Orgyia postica*) have occurred in the Deniyaya and Balangoda districts.

*Helopeltis* also has attracted very little attention, a single complaint from the Galle District and another from Kadugannawa being the only instances that have been brought to notice.

*Tarsonemus translucens* (Yellow Tea Mite) has been reported from the Galle District. *Calotermes militaris*, a White Ant that hollows out the stems of living tea bushes, still occurs sporadically on some of the Lindula estates. Apparently the only cure for this pest, which breeds inside the stems, is to dig out and burn the affected trees.

A very remarkable case of infestation of manufactured tea by a *Dermestes* beetle has been investigated. The tea was packed in the usual way and samples were retained in the Colombo agent's office. These samples show no trace of infection. But when the consignment was opened in Europe, chest after chest was found to be alive with beetles and fouled by the dead bodies of their larvae and pupae. The lead lining of the chests was said to be intact, and there was no evidence that the beetles had been feeding upon the tea. No explanation of the presence of the insects is as yet forthcoming.

*Rubber Pests.*—The large root-borer of Hevea, described and figured in the "Tropical Agriculturist" of September 1910, p. 221, appears to be growing more common in the Kelani Valley district. Complaints of damage by this borer have come in from Avisawella, Padukka, Waga and Undugoda. One correspondent reports that a group of half a dozen 5-year-old trees has been killed by this pest. Six or seven of the grubs have been found

in a single tree. The borer is a large, whitish, fleshy grub, more or less cylindrical in form, but with the segments immediately behind the head much broader than the others. It is the larva of a Longicorn beetle, but of which particular species it is impossible to say at present. Meanwhile it will be advisable for rubber planters to regard all the larger Longicorn beetles with suspicion, and to destroy them when found in their rubber clearings. Specimens have been received of Scolytid beetles (allied to the Shot-hole Borer of tea) extracted from the stems of Hevea trees, and believed (by the senders) to be responsible for injury to the trees; but Mr. Green does not appear to consider them as being of any serious consequence. The principal species that have been found in Hevea trees are *Xyleborus semiopacus*, *X. discolor*, *X. interjectus*, *X. perforans*, *Platypus solidus*, *Eccoptopterus sexspinosus* and *Cryphalus plumierae*.

Among the minor pests which have been the subject of inquiry and investigation are:—*Arbela quadrinotata*, the caterpillar of which tunnels into the angles of the branches of cacao; a Membracid (*Leptocentrus substitutus*), puncturing young shoots of indigo plants; the Pumpkin Fly (*Dacus cucurbitae*), destructive to fruits of vegetable marrow; the Paddle-legged Bug (*Leptoglossus membranaceus*), puncturing various fruits and vegetables; the Painted Bug (*Bagrada picta*) puncturing leaves of cabbages, knol-khol, etc.; the Red Scale (*Aspidiotus aurantii*), on stems of mulberry plants; caterpillars of a Pyralid moth (*Nymphula depunctalis*), defoliating rice plants; a Shot-hole Borer (*Xyleborus coffeae*), tunnelling in young branches of *Coffea robusta*.

*White Ants.*—It has been stated, in several quarters, that the explosion of carbon bisulphide in a termites' nest will kill all the inmates. An experimental test of this method at Peradeniya has proved an absolute failure. Several nests were treated with the liquid (poured into the main shaft of each nest) and the charge exploded. The holes were then blocked up for twenty-four hours, when the nests were opened and examined. The effect upon the insects was apparently *nil*. "Solignum" has proved an excellent preservative of woodwork, against the ravages of white ants. From tests initiated in 1909 it was found that where the wood is exposed to the weather, the effect of the preservative wears off in about three years' time. Samples of Lawton's "Ant-proof Mill-board and Notarial Paper" have been tried experimentally at the laboratory and appear to have withstood the tests satisfactorily. They have not been touched by termites though placed under a plank of wood that was swarming with *Coptotermes ceylonicus* (a species that shows a partiality for the mill-board coverings of books).

*A Pest of Stores.*—Samples of "weevily" ration biscuits have been received from Diyatalawa Camp. They were found to be attacked by two distinct beetles and the larvae of an undetermined moth. The beetles concerned were *Lasioderma testacea* and a species of *Trogosita*.

*Lac.*—Another attempt to establish the Indian lac insect (*Tachardia lacca*) in Ceylon, has been made, but without success.

**VENABLES (E. P.). Injurious Insects in Okanagan District.**—*Proc. Br. Columbia Entom. Soc.*, 1912, pp. 11-16.

*Hyphantria textor* (Fall Web-worm) was more abundant than for many years past; the choke cherry tree, its natural food-plant, is occasionally entirely defoliated. Burning out the webs with a torch is the most simple method of extermination.

*Aphis mali* (Apple Aphis) was fairly numerous in July, and much spraying was required to keep them down in the new orchards. The "black leaf 40" mixture was used with great success in fighting this insect, as well as other species of plant pests. The COCCINELLIDAE were not so abundant as in other years when aphids were common.

*Otiorhynchus ovatus* is becoming more numerous every season, and the damage to strawberry plantations is considerable.

SIMULIIDAE (Black Flies) were very troublesome to stock during late summer and early autumn. The species have not yet been determined.

*Gastrophilus equi* (Horse Bot-fly) is another stock pest which was unusually abundant in 1912.

The following are among the insects also reported as doing variable amounts of damage, occasionally serious:—

*Tmetocera ocellana* (Bud-worm).—Both broods very common at Victoria, rare in the Okanagan.

*Eriosoma (Schizoneura) lanigera* (Woolly Apple Aphis).—Fairly common everywhere throughout this season. Winged forms quite common in the fall; no root forms seen. Not a serious pest in well-cared-for orchards.

CAPSIDAE (Plant Bugs).—Injuries resembling those done by various Capsids were very common to the young apples of some varieties. In some cases this caused an extensive drop of the young apples and in others the fruit remained on the tree, but became badly distorted. Injuries of this kind caused quite a little loss in some places and the subject demands further study.

*Tetranychus bimaculatus* (Red Spider).—Quite common everywhere, doing appreciable damage to plums in some cases.

*Corymbites inflatus* and *C. hieroglyphicus* (Click-beetles).—Very abundant in nearly all parts of the valley, feeding upon the buds and young leaves of young apple trees. Damage done in many instances was considerable and some control measures should be worked out.

*Cercopeus artemisiae* and *Mimetus setulosus* (Bud-weevils).—Not widespread, but doing considerable damage to young apple trees in isolated cases by boring into buds and tender foliage. Deserve further attention.

*Eriophyes pyri* (Pear-leaf Blister Mite).—Quite common, injuring pears only; liable to increase in destructiveness.

*Empoasca mali* (Apple Leaf-hopper).—Very common everywhere; does some damage and is rather difficult to control.

*Malacosoma sp.* (Apple Tent Caterpillar).—Quite common during the month of May. Subject to periodic epidemics, but is easy to control.

*Enarmonia prunivora* (Lesser Apple-worm).—Present in most districts, but not in large numbers.

*Hyphantria cunea* (Fall Web-worm).—Abundant on apples and all shrubs; easy to control.

*Glyptoscelis pubescens* (Grey Bug).—Said to be doing considerable damage by feeding upon the unfolding leaves of young apple trees. The author did not see it actually at this work, but found it upon trees the leaves of which had been badly eaten. Should be watched.

Apple Saw-fly.—A green larva, about 3 cm. long, making burrows in the mature or nearly mature apples on the tree. Did considerable damage in a few cases. It burrows into the apple apparently for the purpose of hibernation, as the larva remains quiescent after making its burrow. Its regular food is probably some wild plant and injury to apple only incidental. More information required.

*Sanninoidea sp.* (Peach Tree Borer). Quite common where peaches are grown; a number of trees were killed.

*Anarsia lineatella* (Peach Twig-borer).—Common, the chief damage being done to the fruit.

*Hemerocampa leucostigma* (White-marked Tussock Moth).—Not common this season, but often a serious pest of shade trees.

*Pseudococcus*, probably *sp. n.* (Mealy bug).—Injuring spruce; easily destroyed by lime-sulphur.

*Chermes similis* (Spruce Gall-louse).—A common and serious enemy of the spruce.

Bezzi (M.). **Intorno ad alcune *Ceratitis* raccolte nell' Africa occidentale dal Prof. F. Silvestri.** [On certain *Ceratitis* collected in West Africa by Prof. F. Silvestri.]—*Boll. R. Scuola sup. Agric. Portici*, vii, pp. 1-16.

The author describes the following species obtained by Professor Silvestri:—*Ceratitis punctata*, Wied., from Konakry in French Guinea, feeding on a species of *Conopharyngia*; *C. inscripta*, Graham, taken in southern Ashanti; *C. stictica*, Bezzi, from the Congo and Ashanti; *C. giffardi*, sp. n., taken at Dakar, in Senegal, feeding on a species of *Chrysobalanus*; *C. silvestrii*, sp. n., also taken at Dakar and feeding on the same fruit as *C. giffardi*; *C. bremii*, from Senegal; *C. morstatti*, sp. n., taken by Dr. Morstatt at Victoria, Kamerun, feeding on kola nuts and destroying the pulp; known to the German planters in Kamerun and Togo as "Springmaden der Kola-Nuss."

Theobald (F. V.). **An unrecorded Apple Sawfly in Britain (*Lygaeonematus moestus*, Zaddach.)**—*The Entomologist*, March 1913, pp. 108-109.

Larvae of this insect were sent to the author from two places in Hampshire and from Berkshire; he has also found it at Wye in Kent. At the localities in Hampshire the flies were doing much damage and stripping the trees.

DUDGEON (G. C.). *Gelechia gossypiella* (Pink Boll Worm).—*Agricultural Journal of Egypt*, ii, pt. 2, 1913, pp. 1-4, 1 pl.

The occurrence of the Pink Boll Worm in Egypt appears to have been overlooked by writers previous to 1911, although specimens have been frequently found throughout the country for many years. The insects infest bolls in the green state in the same localities as those in which *Earias insulana* occurs, and it is possible that damage attributed to the latter is really the work of the former.

In the end of August 1912, a quantity of bolls sent from Kôm Eshon all proved to have been attacked by the Pink Boll Worm, and a very large percentage of bolls examined at Edfina and at Fûa contained larvae of this species.

In West and East Africa the Pink Boll Worm occurs most frequently alone. For the most part the damage done in Egypt has been slight, but it is important to note that in 1912 this insect had done appreciable harm to cotton in the north of the Gharbîa and Beheira provinces.

The larvae enter the bolls when they are more than half ripe, the eggs being probably, though not certainly, laid on the boll itself; the point of entry is, however, exceedingly difficult to find. They feed upon the seeds, usually destroying those in one cell of the boll only, whereas *Earias* frequently destroys all the cells, besides attacking many flower-buds, and other bolls upon the plant.

The author has found *Dysdercus superstitiosus* in Sierra Leone and S. Nigeria, sucking the juices of the Pink Boll Worm; this Cotton Stainer is not found in Egypt. The only other insect which has been noted as attacking the Pink Boll Worm is a Chalcidid, *Chelonus blackburni*, occurring in Hawaii. *Gelechia* has been found recently feeding on Til (*Hibiscus sp.*), and the author has also bred it from pomegranate.

TREHERNE (R. C.). **Life-history of *Otiorhynchus ovatus*, the Strawberry Root Weevil, under Lower Fraser conditions.**—*Proc. Br. Columbia Entom. Soc.*, 1912, pp. 41-50.

This insect is reported as causing great loss to strawberry-growers, not only in the Lower Fraser Valley, but in those sections along the Pacific Coast where strawberries are grown on a large scale. The common names of the pest are:—the "Pitchy-legged Otiorhynchus," the "Strawberry Crown Girdler," and the "Sleepy Weevil." The writer prefers to call it the "Strawberry Root Weevil" because he has not found it attacking the crown in any case, and he believes that it feeds only on the roots of the plant; its larvae having been found on them 6″ to 8″ below the surface. It is far more numerous than *O. sulcatus*, and at present is a serious pest. The incubation period is about 21 days; the larval stage at least 7 months; the pupal stage occupies 21-24 days, and apparently some 12 days more are required for the insect to assume its full adult characters. Adults have been

found to live in captivity from 42 to 67 days, but the author is of opinion that the latter figure should be regarded as a minimum. The insect only feeds at night and during the day-time hides in crevices of the soil under leaves and rubbish. The author is also of opinion that the eggs are laid at night. The larva is more or less omnivorous and has been taken on clover and timothy grass roots, on wild strawberry 500 feet above the sea, and on the roots of the peach: on rhubarb, *Rumex acetosella*, *Potentilla glandulosa*, *Balsamorhiza sagittata*, *Poa cerotine*, *Poa pratensis*, and on white clover; it has also been found in potato fields, though there is no direct proof of its eating potato roots. The local farmers are of opinion that red or crimson clover is not attacked to any appreciable extent. Adults have been caught feeding on the fruits of strawberry, raspberry, vine, peach and apple. The leaves of strawberries are also eaten, but not to any great extent. Treherne is strongly of opinion that no special variety of strawberry is either safe from the attack of the insect or specially liable to such attack. Some resist better than others, and he recommends certain varieties of vigorous growth with deep roots. The larvae attack the roots by making longitudinal slits in portions of the epidermis, subsequently girdling the roots either directly or in a spiral manner. The pupal stage is passed at from 4″ to 6″ or even 8″ below the surface. The most serious damage is done in early spring when the larvae are nearly full-grown and are capable of attacking the main roots of the plant, which are sometimes nipped off 2″ or so from the crown. The author summarises the observations as to attack as follows:—"if no injury to the plantation has become apparent by the end of June of one year, no further injury will become apparent that year" or in other words, "the plants attacked in the spring of one year, having reached their highest degree of injury by the end of June, for the remainder of the year tend to improve and re-establish themselves in the soil." This point should be made use of in the matter of applying commercial fertilisers.

The female appears to lay about 50 eggs over a period of 4 or 5 days. This period may be extended to as much as 15 days. The eggs are laid from the end of June to the end of August, varying somewhat according to season. There appear to be two periods of the year in which the insect migrates, though it has a strong tendency to remain localised, provided there be sufficient food and protection. The first migration takes place about the middle of July, during the egg-laying period, and the second during the autumn, possibly for the purpose of seeking winter quarters. What proportion of the insects actually migrate, has still to be determined, for hibernating adults can be found all the year round on the surface of the crown in a strawberry plantation. Strawberries grown on the matted row system are not as a rule seriously affected the first year after planting, unless the soil was previously infested by the insect. The injury is noticeable in the third summer, often reducing the crop 50 crates to the acre from what might, with reason, be expected. Where the plantation is kept down for more than 3 years the crop may be totally destroyed.

Rotation on a large scale, that is to say, removal of the strawberry ground to a considerable distance from that occupied by the previous crop, is recommended. Unfortunately this is not so effective as it might be because the insects feed on the roots of such vegetation as they find on the way to the new plantation. The pest is considered to be so serious that unless radical measures are taken to prevent its introduction into strawberry plantations the industry will prove altogether unprofitable. The following remedial measures are suggested:—(1) the growth of strong varieties; (2) the running of chickens over the grounds; (3) trapping the adult weevils under boards (only useful to small growers); (4) the use of some sticky material as traps; (5) spraying with arsenate of lead (only useful after the first crop is harvested and when the weevils are very numerous); (6) chemical remedies, potassium cyanide and carbon bisulphide; but the author is doubtful whether any remedy of this kind can be used to kill the eggs, larvae or adult which will not at the same time destroy the plant; (7) burning the plants immediately after the first crop has been gathered by covering them with dry straw and setting fire to it; (8) ploughing at the end of July or at the beginning of August, with frequent cultivation previous to or during winter; (9) autumn planting; (10) plant renewal during the middle of the second summer; (11) one-year crops instead of two-year crops, though this is not satisfactory; (12) rotation of crops is strongly advocated in this order, derived from local experience:—strawberries, potatoes and rhubarb, and not more than one acre in ten to be laid down to strawberries in an infected locality.

Serbinow (I. L.). **Chernaia cherva.** [" Black brood " in bees.] —*Vestnik Russkaro obstschestva pchelorodstva*, no. 11, Nov. 1912, pp. 426-429.

The author deals with the disease known as " black brood " and describes his own experiments on the nature and origin of this dangerous pest of the larvae of bees.

Upon the first appearance of this disease in the years 1898-1900 in New York it was taken to be the well-known " foul brood," but later on it was recognised as a special disorder, not all the symptoms of the latter disease having been found in the former. Whereas the larvae attacked by " foul brood " show considerable ropiness and have a strong smell of hot joiner's glue; in the case of " black brood," the ropiness is less distinct and the smell rather resembles that of sour apples. " Black brood " attacks the sealed as well as the unsealed larvae, the dead ones turning first yellow, then brown and finally black. The opinion that this is a distinct disease was shared by Root, who named it the " New York disease," and by many prominent beemasters. According to their opinion " foul brood " is caused by a bacterium known as *Bacillus alvei*, whereas the cause of " black brood " is some other unknown bacillus. Investigations carried on in late years by other investigators, especially by White and Moore, led to a new controversy as to the nature of this disease, and White came to

the conclusion that *Bacillus alvei* usually provokes "black brood" which is the true form of "foul brood," the disease commonly known under this name being only a special "slimy form" of the former and resulting from the action of a special bacillus.

During last summer "black brood" appeared in some of the author's hives and he decided thoroughly to investigate its nature and origin. He gives the following description of the cause of the disease. "Black brood" attacked only the unsealed larvae in all their different stages, starting with the eggs. The infected larvae lost their pearly appearance, occasionally took on an irregular form, their bodies being streaked first with grey and afterwards with small black striae. At this stage the larvae were already dead. Later on they turned black and sunk to the bottom of the cell in the form of a black slightly ropy mass, having a smell resembling that of sour apples, which, however was never very strong. The workers were all the time busy trying to separate the eggs from these larvae and clean them, but as the disease runs its course in 2-4 days and spreads quickly through the hive, they cannot succeed in throwing out all the bodies of the dead brood.

In order to discover the origin of the disease the author prepared cultures of the bacteria, using ordinary alkaline meat-pepton agar, and also on agar from an extract of the brood by Maassene's method. The results were in both cases similar, and in addition to the bacteria usually found in dead larvae, *B. mesentericus*, *Sarcina lutea* and *S. aurantiaca*, he found large colonies of *B. alvei*, together with the fungus, *Aspergillus sp.*, occurring always amongst them. Having obtained a pure culture of these bacteria he cultivated them on alkali meat-pepton bouillon and afterwards infected the bees in the observation hives by putting in them frames with young bees, not yet able to fly, and sprinkling over them the bouillon cultivation of the two last-named bacteria. On some frames the cultivation of the *B. alvei* only was used, on others a combination of the latter with the *Aspergillus*, and lastly cultivations of *Aspergillus* only. The results were similar in all three cases and the brood in every one of these developed symptoms of the "black disease." The external appearances were very unlike the typical "foul brood" of the unsealed larvae. The larvae died with all the symptoms described above. In no single case was either the typical ropiness or the smell of hot glue observable. The dead larvae were only very slightly ropy and had a slightly sour smell. The sealed larvae were always unaffected, though there were but few of these, as they almost always died before they were sealed up.

The author examined also the pollen, which for reasons which were not very clear, was brought by the bees in considerable quantity. He found that all the pollen in the neighbouring cells contained *B. alvei* and that the fresh pollen contained both the above-named bacteria.

The author arrives at the conclusion that the external symptoms of the disease known as "black brood" do not depend upon *B. alvei* and the *Aspergillus*, nor does it appear to be of conse-

quence whether the brood is infected by one or both of them, but only upon the external conditions of the larvae, the kind and quality of their food, etc. With regard to the question of the infection of the larvae by this disease the author maintains his previously expressed opinion that the *B. alvei* is taken up from dirty water and he is satisfied that the pollen may also serve as a source of infection. He is inclined to the conclusion that the difference in the external symptoms between the "black brood" and "foul brood" is produced by the bees, in the case of the first disease, feeding on infected pollen, whereas in the case of the latter the infection is derived from water. He has further no doubt that in his own hives the queens helped to spread the disease, as by laying eggs in dirty cells, they carried the bacteria on their bodies to other cells; in the same way they transported the disease from the cells containing infected pollen. He described one of the queens as always laying her eggs in the pollen, and while taking them over to the empty cells the bees carried the bacteria with the eggs. As to the method of dealing with this disease the author disagrees with the recommendations of Root and McEvoy. According to him, the only way to get rid of the "black disease" which is undoubtedly "foul unsealed brood" is to drive the bees over to a new, clean and dry hive, and to change the queen, disinfecting at the same time the hives, the instruments and the hands of the worker. The same journal contains a report of a meeting of the Russian Beekeepers' Society held on 21st October last, at which Madame S. E. Djatchenko read a report on beekeeping in the Government of Mohilov in which it was stated that "foul brood" was spreading in this district, and in the discussion which followed the opinion was strongly expressed that a conference of instructors and experts of the representatives of beekeeping societies should be called to organise measures for dealing with the disease.

BEZZI (M.). **Altre *Ceratitis* africane.** [Further African *Ceratitis*.]—*Boll. R. Scuola sup. Agric. Portici*, vii, 10th Feb. 1913. pp. 19-26.

This is a systematic description of certain species of *Ceratitis*, reared by Professor Silvestri from various fruits in Konakry, French Guinea, and in Lagos, Southern Nigeria.

*Ceratitis anonae*, Graham, bred at Lagos, from the fruit of *Spondias lutea*, originally described from Southern Ashanti, as feeding on *Anona muricata*.

*Ceratitis stictica*, Bezzi, from the Belgian Congo, Southern Ashanti and Lagos; also a new variety, *antistictica*, from Lagos.

*Ceratitis giffardi*, from Lagos and Konakry, from the fruit of *Sarcocephalus esculentus*. Silvestri also obtained from Konakry, from the same fruits, a number of specimens of a fly, belonging to the family LONCHAEIDAE, which Prof. Bezzi regards as *Lonchaea glaberrima*, Wied. The African specimens are, he says, identical with others obtained from Brazil, where this species does great damage to various kinds of fruit. The question as to whether the fly was imported from the Brazils to Africa, or whether Africa is its native country, is difficult to determine.

*Ceratitis tritea*, Walk., Lagos, feeding upon a native fruit, species not known; originally described from Sierra Leone.

*Ceratitis nigra*, Grah., var. *nigerrima*, nov., feeding on an undetermined species of native fruit at Lagos.

**Report on Insect Pests in Barbados.**—*Agric. News, Barbados*, xii, 15th Feb., 1913, pp. 58-59.

The report of the Local Department of Agriculture for 1911-12, is published as a supplement to the Official Gazette, 24th January, 1913.

A scale-insect, new to the West Indies, is reported to have been discovered on cacao plants from St. Lucia. This insect, *Pseudaonidia (Aspidiotus) trilobitiformis*, was previously recorded from Brazil, and from several Asiatic localities. The following fungi, parasitic on scale-insects, are recorded: *Cephalosporium lecanii* (shield-scale fungus), *Sphaerostilbe coccophila* (red-headed fungus), and two others not yet satisfactorily identified. *Vinsonia stellifera* (glassy star scale) has been found to be attacked by a fungus, probably belonging to the genus *Aschersonia*.

*Heliothrips rubrocinctus*, Giard, the cacao thrips, is recorded as having reached the island on leaves of grape vine, mango, and croton. *Euthrips insularis*, Franklin, is reported on rose trees, and on bonavist. Another species of *Euthrips* occurred on sweet potatoes, and *Heliothrips haemorrhoidalis*, Bouché, on fiddle-wood (*Citharexylum quadrangulare*).

A mite which sometimes occurs in large numbers on the young internodes of sugar cane, whilst these are still enclosed in the sheathing leaf, has been under observation during the past year.

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This mite causes the surface of the cane and the edges of the leaf-sheath to become covered with quantities of minute blisters. It has been described as *Tarsonemus spinipes*, Hirst, and is fairly common in several of the West Indian Islands.

The larvae of a rove beetle (STAPHYLINIDAE) have proved useful in keeping down the attack of the red spider on sweet potatoes. The natural control of *Aphis* on melons by ladybirds and Hymenopterous parasites is also recorded.

The cotton leaf blister mite was discovered in Barbados in February 1912 for the first time. An area of about two miles wide and 6 miles long, to the north of Bridgetown, was more seriously infested than any other district, although two miles or more from the point of discovery. How this pest was introduced is not known, but the manner in which it has spread lends colour to the supposition that it has been brought by birds.

*Diaprepes abbreviatus* and *Phytalus smithi* are recorded as attacking sugar-cane. With regard to the former it has been found that when the larvae are deprived of food, by digging the cane-stumps after the crop is reaped, they penetrate deeper into the soil, and there construct an earthen cell in which they lie dormant for some time, and that after three months they are still alive, and capable of resuming feeding when opportunity offers. The eggs are found to be laid on the cane leaf, near the tip, where it has been split by the action of the wind. The two adjacent portions are brought into contact, and their surfaces stuck together by an adhesive substance, deposited by the female insect. The eggs are thus well protected. The collection of the beetles is thought to be the most effectual means of keeping down this pest, and it is recorded that during one week over 9,600 were captured on one estate. The practice of reaping infected canes early, followed by the immediate removal of the cane-stools, and a rotation of crops is recommended as a useful control measure. The Report says that it is only when the root-borer is present in some abundance, that it can be regarded as a serious pest, and where it becomes numerous, it can undoubtedly be checked if trouble be taken to do so, though it may involve some deviation from estate routine.

A black wasp of the family SCOLIIDAE, *Tiphia parallela*, Smith is exceedingly abundant, and is found to be parasitic on *Phytalus smithi*, which probably accounts for the fact that *Phytalus* is not a pest of consequence in Barbados, whereas in Mauritius, where the beetle has been introduced without the parasite, it is a very serious pest of sugar-cane.

RUSSELL (H. M.). **The Red-Banded Thrips.**—*U.S. Dept. Agric., Bureau Entom.*, Bulletin no. 99, pt. 2, 14th Dec. 1912. 29 pp.

For about 12 years the Red-banded Thrips (*Heliothrips rubrocinctus*, Giard) has ranked as an important insect pest of cacao in the West Indies, where it is known as the Cacao Thrips. It has recently obtained a foothold in Florida, where it is attacking

principally the mango and the avocado pear. The author uses the term Red-banded Thrips because the term Cacao Thrips is scarcely applicable in a country like the United States in which cacao is hardly grown. The insect was first described in 1901 from Guadeloupe, and Urich in 1910 recorded it as feeding on cacao, guava, roses, almonds and mangos in Trinidad. In 1911 it was reported by Higgins to be injuring mango seedlings in the greenhouses of the Agricultural Experiment Station in Hawaii, and in 1912 it has been found on mango plants received in U.S.A. from Mauritius. Damage to the mango leaves is done by adults and larvae in the same way. They first pierce the epidermis and then scrape out the leaf tissue below, leaving a minute spot where this has been removed, which becomes brown. When there is a large number of these spots they run together, forming large brown patches near the main or side veins, and the leaves turn brown and dry up. In severe cases the whole leaf surface is entirely destroyed. It has not yet been observed to attack the fruit, but it is quite possible that as it attacks the pods of cacao it may attack the fruit of mango and avocado. The eggs require 15 or 16 days for incubation, though this varies considerably with locality and temperature. In Trinidad the larva develops in 6 days; in Florida this requires 6 to 20 days. Urich found the pupal stage to last from 2 to 6 days. In Trinidad the life-cycle from the time of hatching, with an estimate of 4 to 6 days for the egg-stage, until the appearance of the adult, is approximately 16 to 18 days; in Washington from 28 to 43 days; in Florida 20 to 43 days and possibly longer. It is estimated that 10 generations per annum are possible in Florida.

The author has not observed any natural enemies of this Thrips and says that the heavy summer rains that occur in Florida are the chief agents in its destruction. A spray made of one part of black leaf tobacco extract containing 40 per cent. nicotine to 1,500 or 2,000 parts of water, with 1 pound of whale-oil soap to every 50 gallons, has been found to give very good results. A more or less complete bibliography concludes the article.

Priego (Juan M.). **The present condition of Citrus growing in Spain.**—*Mthly. Bull. of Agric. Intell. and Plant Diseases, Int. Inst. Agric. Rome*, iv, no. 2, Feb. 1913, pp. 161-166.

The author says that the list of pests which infest the Spanish orange-groves with greater or less intensity is a long one, but that the following are the most important:—*Chrysomphalus dictyospermi*, Mask. ("piojo rojo"), *Mytilaspis citricola*, Pack. ("serpeta"), *Dactylopius citri*, Risso ("cochinilla algodonosa"), and *Aspidiotus hederae*, Vallot ("piojo" or "cochinilla blancos").

The first of these is the most important, owing to its prevalence and the damage it does. The agricultural associations and Government inspectors have organised a campaign against this

scale, which began to be effective as soon as hydrocyanic acid fumigation was taken up, and the worst attacked provinces were provided with the necessary staff and appliances for the work. The Committee of "ingenieros agronomos" to whom the work was entrusted has now 32 tents and an efficient staff of trained men.

PEREIRA (S. do M.). **Reconstitution of Portuguese Vineyards by means of American Stocks.**—*Mthly. Bull. of Agric. Intell. and Plant Diseases, Int. Inst. Agric., Rome*, iv, no. 1, Jan. 1913, pp. 3-7.

The author in describing the struggle against *Phylloxera* in Portugal says that it was introduced about 1872 by some French stocks planted in a vineyard in Douro, and that the pest was for a fairly long time limited to that district. Planting in sandy soil was practised and there are still important vineyards on the sands of the coast and of the interior. In the great vineyard of José Maria dos Santos, which the author says is possibly the largest vineyard in the world, the greater proportion of its area is sandy soil covered with ungrafted vines. The land was broken up by steam before planting, and this operation brought to the surface a clayey sub-soil in places near the middle of the vineyard. The whole of the vines planted on these parts of the estate died of *Phylloxera* in a short time, those on the sandy soil resisting.

The clayey areas were re-planted with American stock. If those plantations be excepted, that is to say, those of ungrafted vines that are protected by flooding or by their situation on sandy soils, it is difficult, the author says, to find vineyards which are not completely infested by *Phylloxera* in Algarve.

**Miscellaneous Insect Notes.**—*Connecticut Agric. Expt. Station*, Report for 1912, pt. iii, 1913, pp. 291-296.

A Gall Beetle of Hop Hornbeam, first noticed in 1911 has been investigated and found to belong to the genus *Agrilus* (BUPRESTIDAE) and has been named *Agrilus champlani*. The Spruce Bud Moth (*Tortrix fumiferana*, Clem.) was unusually abundant in 1912. The larvae of this moth are reported from other States to have done a great deal of damage, defoliating and ultimately killing the spruce trees. In the case of ornamental and shade trees a spray made of 5 lb. of lead arsenate in paste, or 1½ lb. dry, to 50 gall. of water has been found useful. A Chrysomelid beetle has been discovered in English ivy, imported from Holland, and identified as *Agelastica (Galeruca) alni*, L. This insect has been reported as skeletonising the leaves of various species of alder in Europe. The Southern Cabbage Butterfly (*Pieris protodice*, Boisdv.) is not common in Connecticut, but specimens have recently been taken. *Tolype velleda*, Stoll, the larvae of which feed upon apple, pear, cherry, maple, oak,

willow, poplar, and lilac, was unusually common in Connecticut in 1912, though the damage done by them is possibly hardly sufficient to cause them to be regarded as pests, at least at present.

The Elm Sawfly, *Cimbex americana*, was somewhat abundant in 1912. Spraying with lead arsenate is regarded as the proper treatment for trees. The potato aphis, *Macrosiphum (Nectarophora) solanifolii*, Ashm., has been found on maize as well as on potatoes. For several years this aphis has done considerable damage in neighbouring states to the potato crops. Spraying with kerosene emulsion is useful, but only practicable for small areas. The Tulip Tree Scale, *Toumeyella liriodendri*, Gmel., the largest scale-insect in the U.S.A., is doing increasing damage, sometimes killing the lower branches of tulip trees and afterwards invading the higher ones. The proper treatment is to spray with kerosene emulsion during the latter part of September, which kills the young scales. The Juniper Web-Worm, *Phalonia rutilana*, Hübn., has been found attacking red cedar and is a somewhat widely distributed pest. Spraying with lead arsenate will probably prove of service in the case of ornamental trees or shrubs. Ash trees have been badly damaged by a small mite, identified as *Tetranychus bimaculatus*, Harv., and chrysanthemums by another mite, *Tarsonemus pallidus*, Banks.

SASSCER (E. R.). **The Genus *Fiorinia* in the United States.**—*U.S. Dept. Agric., Bureau Entom.*, Tech. Ser. no. xvi, pt. 5, 6th Dec. 1912, pp. 75-82.

The author says that there are only two species and one variety of *Fiorinia* established in the United States, viz., *Fiorinia fioriniae*, Targ., *F. theae*, Green, and *F. fioriniae japonica*, Kuwana. He is certain that the first two of these Coccids were imported on ornamental plants, whilst the last-named variety has reached the United States from Japan and has only established itself in one State. It is believed that *F. theae*, Green, was originally introduced on *Camellia japonica* and that it now shows decided preference for the tea-plant. In the United States it is known on Camellias in Alabama, Columbia, Florida, Georgia, Louisiana, and North and South Carolina, where it is not infrequently associated with *Lepidosaphes lasianthi*, Green. The following have been described as its natural enemies:—Two Coccinellids, *Chilocorus bivulnerus*, Muls., and *Microweisea misella*, Lec., and a Nitidulid, *Cybocephalus nigritulus*, Lec. *Fiorinia fioriniae*, Targ., is known practically all over the world and is of common occurrence on Kentias in greenhouses; a lengthy list of food-plants is given. The red-headed fungus (*Sphaerostilbe coccophila*) is recorded from Mauritius as attacking this Coccid on Camellias.

*Fiorinia fioriniae japonica*, Kuw., appears to have been obtained chiefly from imported plants at the quarantine stations.

A description of the insects and a bibliography is given in each case.

CHITTENDEN (F. H.). **The Potato-Tuber Moth** (*Phthorimaea operculella*, **Zell**).—*U.S. Dept. Agric., Bureau Entom.*, Circular no. 162, 4th Dec. 1912. 5 pp.

This moth has been for many years the worst potato pest in California. It has now reached the State of Washington and threatens to invade adjacent States. It also feeds upon the tomato, egg-plant and tobacco, though not as a rule doing much damage to these. It is known to tobacco-growers as "split worm." Two generations are generally produced in nature in the course of the summer and it is certain that a third can be produced in store. It is well-known in Hawaii, all over Australia, New Zealand, and Algeria, and many other countries including southern Europe, and though there may be some doubt as to whether it is absolutely identical with the species infesting tobacco, it has long been known to tobacco-planters in Florida, the Carolinas and Virginia. The amount of damage done is at times very serious. Two growers alone near El Monte, Cal. are reported to have lost $90,000 and $70,000 respectively last year. The moth is exceedingly difficult to control, as the larvae cannot be reached in their burrows in the potatoes in store or in the stalks or tubers growing in the fields. Clean methods of cultivation are very necessary. All infested potato plants and Solanaceous weeds must be carefully destroyed by fire. Sheep and pigs are also valuable if turned into the potato-fields with proper precautions. Crop rotation, as in many other cases of insect injury, is very desirable and the co-operation of all potato-growers in the neighbourhood is practically a necessity. It might even be found necessary to prohibit by law the planting of any potatoes over a large area for one year and to require at the same time the destruction of all weeds likely to harbour the pest. The alternate food-crops which do not suffer materially from the attack of this insect are peas, beans, cow-peas, alfalfa and clover. Sugar-beets, celery, and crucifers may also be used. Grain is not attacked by the moth and is therefore useful for rotation. The greatest care is required in digging the crop of potatoes, that none should be left in the ground: they should not even be left in the field over-night. The best remedy appears to be fumigation in closed chambers with bisulphide of carbon or hydrocyanic acid. The author recommends 3 pounds of bisulphide to every 1,000 cubic feet of potatoes and says that 1 ounce to a barrel of 96 pounds capacity is not excessive. The exposure, whether in the chamber or in the individual barrel, should last at least 24 hours.

**Insects Injurious to Garden Crops in France.**—*Bull. Soc. Nat. d'Acclimatation*, no. 5, 1st March 1913, pp. 152-155.

Members of the Society reported damage to garden peas, by black and green aphis, *Thielaria pisicola*, and that the methods hitherto used for controlling it have not yielded any appreciable

result; there is considerable fear that the cultivators in the neighbourhood of Rouen may suffer very seriously from its ravages.

*Tetranychus major*, which is regarded as a specific parasite of the lime tree (linden), has, in the past year, done enormous damage to avenues in Maisons-Lafitte, Saint-Germain-en-Laye, and Melun. Spraying with nicotine solution, or soapy emulsion of petroleum, is said to be thoroughly effective.

Potatoes in the South of France have been very seriously damaged during the past two years by *Phthorimaea solanella*. Damage by this insect in France is said not to have been previously recorded. The species is known in Algeria, where it does a certain amount of damage to the early potatoes, but it is never serious because the climate is not suitable for storing them. It is found, in France, that if the potatoes are stored in as dry a place as possible, and covered completely with a fairly thick layer of sand or of light soil, the attack of the insect is prevented, but care must be taken to keep them covered, otherwise the eggs are laid at once on the exposed potatoes.

HOLLOWAY (T. E.). **Insects liable to Dissemination in Shipments of Sugar-Cane.**—*U.S. Dept. of Agric., Bureau of Entom.*, Circular no. 165, 27th Dec. 1912, 8 pp.

The danger of disseminating injurious insects by the transport of sugar-cane is of two kinds, (*a*) the importation of new pests from other countries, and (*b*) the transport of a local pest from one part of the country to another. The detection of insect pests in sugar-cane at the port of entry is not easy, as there may be borers within the cane which cannot be detected unless the stalks are cut open and consequently spoiled. Fumigation by poisonous gases appears to be very unreliable in the case of sugar-cane, as these do not penetrate the stalk. Experiments as to the value of dipping the cane in certain solutions are in progress.

Amongst the insects liable to be imported are, *Castnia licus*, Drury, the larger moth-borer, a native of South America, extending northward to Mexico and well-known in Trinidad; and the weevil borers, known in the West Indies and probably in South America and Mexico. These have been found in experimental gardens in Texas and New Orleans and elsewhere. Frog-hoppers are a great pest in Trinidad and a species has been discovered near New Orleans, but not yet described, though it is known not to be the species common in Trinidad. There are apparently several Leaf-hoppers in the United States, but they do not appear to be injurious. *Perkinsiella saccharicida*, Kirkaldy, was accidentally introduced from Queensland into Hawaii, and it is possible that it may be brought from Hawaii to the United States, more especially after the opening of the Panama Canal. *Pseudococcus sacchari*, Ckll. (Pink Mealy-bug) is not known to occur in the United States, but is common in Cuba, Porto Rico, and in South America. *Scapteriscus didactylus*, Latr., the West-Indian Mole Cricket, is very destructive in the West Indies and especially in Porto Rico and South America.

The following insect pests of sugar-cane are found in the United States: *Diatraea saccharalis*, F. (Sugar-cane Moth-borer) has probably been introduced from the tropics, though the time of its introduction is uncertain. The injury done by the larvae in the early spring is known as "dead heart" and consists in the decay of the tender shoot of the young plant. It destroys a large percentage of the "eyes," thus reducing the stand of plant cane. It stunts the growth of the cane and affords an opening to fungus diseases through wounds in the stem; it is also the chief cause of injury to plantations by wind, as the weakened canes are unable to resist. The distribution of the moth-borer seems to be limited to the southern half of Louisiana and the lower Rio Grande Valley in Texas. There are a number of sugar-growing districts within this area in which, however, it is not as yet known.

*Pseudococcus calceolariae*, Mask. (Grey Mealy-bug), called in Louisiana "pou-a-poudre." It is believed that this insect was imported into southern Louisiana about 28 years ago. It is at present limited to a certain area in this State and especially to plantations along the Mississippi River, but it has been found also at the experiment station at Brownsville, Texas. A sugar-cane Aphidid has been found during 1912 at a number of places in southern Texas. It appears to be a new species and is not known to many sugar-planters. There is very little information at present about it.

The author concludes with a statement that the principal insects injurious to sugar-cane in the United States have been practically all inadvertently introduced from the tropics, and that the most extraordinary efforts are justified to prevent the introduction of other pests.

MORSTATT (H.). **Bemerkungen zur Kultur und den Krankheiten des Kaffee am Meru.** [Notes on the Cultivation and Diseases of Coffee in Meru, German East Africa.]—*Der Pflanzer*, ix, pt. 2, Feb. 1913, pp. 63-77.

Coffee is steadily becoming the most important crop in Meru in consequence of the favourable conditions of soil and climate. The injurious insects and diseases which attack this crop are for the most part already known and are in general only such as affect young plantations. The coffee borer (*Anthores leuconotus*) and the coffee bug (*Antestia variegata*) are the only pests which demand serious attention, and these have been more or less successfully kept down, the loss from their operations being reduced to a minimum.

The local conditions of rainfall, position of the plantations, nature of the soil, and the excessive cost of the transport of manure, necessitate certain special methods of cultivation, and the use of shade-trees (especially Grevilleas), which have an important bearing upon the attack of insect pests. The coffee grown in shade is less exposed to their attack, and this applies not only to the smaller insects, such as scales and aphides, but the

danger of the spread of the coffee borer and the coffee bug is said to be greatly diminished. The effect of shade in mitigating the ravages of the coffee bug has been observed in Usambara and in Aruscha; the author further says that the development of *Hemileia vastatrix* is notably less in shaded than in unshaded plantations. The fallen leaves of the Grevilleas also keep down weeds, which might serve as food-plants for noxious insects, and in other ways diminish the cost of upkeep of the plantations. The pruning of the older trees is an operation requiring care and should be directed to the removal of all vertical and interlacing branches. The attack of the coffee bug renders its execution difficult by causing the death of buds and small shoots, with the consequent production of numerous adventitious buds: the trees become unduly bushy and it is exceedingly difficult to bring them back to the proper shape.

As stated above, most of the coffee pests in Meru are those which attack only young trees and which tend to disappear as the trees grow older; this has also been observed to be the case in Usambara. The author, however, lays stress on the fact that many of these insects are but little known and that planters should collect and send them for identification as often as discovered.

Termites are common in all plantations and after rain often build mounds round the trunks of the coffee trees, but, as a rule, confine their attention to the old bark, though the author has met with cases in which they have gnawed the living bark of the tap-roots of young trees and caused their death. Repeated drenching of such nests with water has been found to be very effective, and the heaping of wood-ashes round the trunk prevents the attack. The common species is *Termes badius*. Only two species of leaf-miners have been observed, the mining flies whose burrows chiefly destroy the old leaves and the coffee moth, *Leucoptera (Cemiostoma) coffeella*, Guér.,* which, though occasionally very plentiful in some localities, has not as yet done any serious damage. The round brown spots on the leaves in which the larva lives are easily distinguished from other leaf-spots in that the epidermis covering them is dry and if the leaf be bent it cracks off.

The small caterpillars of *Thliptoceras octoguttale*, Feld., (the coffee Pyralid) are found everywhere and often do serious damage, attacking the flower-buds, the unripe berries and the tips of young shoots; they may readily be tracked by their excrement. The damage to the flower-buds is serious, and when the bunch on one internode is destroyed the larvae proceed to the next. The berries are bored close to the stalk and the unripe beans gnawed. Shoots are attacked from the tip and the caterpillar eats its way downwards through the heart of the shoot, which withers and dies. The only remedy which the author can suggest against this pest is the removal and destruction of all bunches of buds which show signs of attack, care being taken to cut them low

* [If the determination is correct (and the species of this genus are often extremely difficult to distinguish) the occurrence of this moth in Africa is noteworthy, for according to Mr. J. H. Durrant there is no authentic record of it outside the West Indies and Tropical America.—Ed.]

enough to make sure of taking the larva in its burrow. The cocoons of a Limacodid moth of the genus *Miresa* were frequently observed by the author on the stems of the coffee trees, but not in sufficient numbers to be regarded as a pest. The young plantations are however seriously damaged by a cutworm, and occasionally the greater part of the newly planted coffee is destroyed by it. Small deep holes are gnawed in the neck of the tap root and the stems wither and die. Being night-feeders these caterpillars are difficult to observe; they do the largest amount of damage during the first and second years and in the months of August and September, but disappear entirely when the trees grow older. Drenching the roots with water or piling wood-ashes against them is useful at the time of attack, but the better plan is to endeavour to clear the land of them by hoeing or ploughing and so exposing the caterpillars to the attack of birds; direct collection by hand is worth the labour. A black beetle which gnaws the stem just above the ground occasionally does much damage; the holes are not circular, like those made by the cutworms, but about 2 cm. broad; sometimes these holes are observable 30 cm. up the stem and this is never the case with the cutworm. The result is very much the same: the young trees wither and die and even if earthed up few seem able to recover themselves. This beetle has not yet been sufficiently observed, but a specimen sent to the author proved to be a Tenebrionid; it usually appears from March to May, after the planting out and after the rainy reason, and then disappears entirely. As it cannot fly, it ought to be found in the planting holes; it is never found on old trees. An as yet undiscovered pest, either a caterpillar or a beetle, eats the young plants in the seed-beds, working only at night.

The worst enemy of the coffee plant is the white coffee borer, *Anthores leuconotus*. In the Kilimanjaro district it has now been found in Kibongoto and Mamba and in three plantations in Meru. In plantations on high ground in the neighbourhood of forests special care must be taken to prevent attack, as there is little doubt but that the insect passes from the forest to the coffee, as it has not yet been found in those plantations which are surrounded by prairie or by more or less dense bush. Whenever it makes its appearance it must be combated without remission. The best time for cutting out the larvae is from September to December, as during this period most of the larvae have done their work in the bark and are boring into the stem. In Meru the natives have learned to recognise the larvae in this stage and appear to be able to find them without difficulty. Perhaps the dryness of the climate has something to do with the visibility of the holes, for this is rarely the case in Usambara. The larvae are either cut out, or dragged out or killed with a hooked wire, and as the natives are paid a small fee for catching them they frequently collect larvae in the neighbouring forests, generally not those of the coffee borer. The author remarks that it would be money well spent if in this way the food-plants and habits of the coffee borer in the wild state could be discovered. When the larvae have bored into the stem beyond the reach of the hooked wire, the saw or bill-hook must be used to lay bare the burrows:

new burrows are then often found. If the larva has attacked the tap root, or even the main roots, a condition often found in Meru, the tree should be cut down and burned.

In only one case did the author come across the Anthribid borer *Phloeobius catenatus*, Kolbe, already reported from Nduruma. Leaf-eating beetles were more or less abundant, among them a weevil, *Systates pollinosus*, Gerst., and another bluish leaf beetle. The coffee bug, *Antestia variegata* var. *lineaticollis*, is fairly distributed in Meru, and on some plantations has done serious damage, though for the present its activities have diminished. The effect of the attack is plainly visible in the number of adventitious buds and the generally bushy habit of the tree; as a result few flower-buds are formed and the yield of fruit is insignificant. The period from January to March is that at which the attack reaches its maximum and in which also the most fruitful results of operations against the pest can be obtained. The collection of the bugs and their eggs by women and children pays well in small plantations, and especially when they appear in large numbers. Spraying has not yet been sufficiently practised in Meru to enable an opinion to be formed as to its value. Both petroleum emulsion and arsenical solutions have been found to burn the leaves, although effective against the bugs. The author thinks the solutions were probably used too strong and at the wrong time of day. He gives the following formulae:—

(1) *Tobacco solution.*—Tobacco leaves or stalks, 3 to 4 kilogs., well boiled in 10 litres of water; allow to stand 24 hours and strain; dissolve 2 kilogs. soft soap in 4 litres hot water; mix the two solutions and dilute with cold water to 100 litres.

(2) *Arsenical solution.*—Sodium arsenate 100 grm., sugar or treacle 1 kilog., water 100 litres.

(3) *Petroleum emulsion.*—Dissolve ½ kilog. hard soap in slices, or the same weight of soft soap, in about 5 litres of hot water; stir in 1 litre of petroleum and dilute with water to 100 litres.

(4) *Simple soap solution.*—Soft soap ½ kilog., water 100 litres.

In Meru the tobacco solution has proved highly useful against scale and aphis; the arsenical and petroleum mixtures require more care in handling or the foliage will be damaged.

Other bugs on coffee in Meru are:—A species of Pentatomid resembling, but rather larger than, the true coffee bug; another, still larger, *Callidea bohemani*, Stål, easily mistaken for a beetle, is often very numerous on some trees; *Sphaerocoris annulus* var. *ocellus*, Klug, is also not uncommon; none of these are at present regarded as pests, but the author is strongly of opinion that they should not be neglected. The black coffee aphis, *Aphis coffeae*, is increasing in the younger plantations, and would do much damage if not kept down by tobacco spray. The green scale, *Lecanium viride*, is widespread and a pest of young coffee, and in some cases the damage was serious in the first half of the year; the cutting of badly infested twigs and rubbing the twigs with the hand was found very useful, but spraying the *under side* of the leaves with tobacco solution proved the most efficacious remedy. *Ceroplastes ceriferus* and another hemispherical *Lecanium* were also found on coffee.

*Hemileia vastatrix* is, according to the author, to be found everywhere in the district under consideration, but the attack is so limited that no real damage has been done; this he attributes to the dryness of the climate. The fungus was not observed in very young plantations. *Hemileia* in Meru takes on a form which might prevent its recognition as such, dark patches of varying form being confined to a large portion of the point of the leaf; these patches are of a brighter brown on the under than on the upper side of the leaf.

Escherich (Prof. K.). **Die angewandte Entomologie in den Vereinigten Staaten.** [Applied Entomology in the United States.] Paul Parey, Berlin, 1913, 196 pp., 61 figs. Price 6 marks.

This book is a report of the results of a journey to the United States, undertaken for the purpose of studying the methods there employed in dealing with insect pests, at the invitation of Dr. L. O. Howard, Chief of the Bureau of Entomology, the expenses being borne by Mr. Andrew Carnegie. After spending a fortnight in Washington in a study of the organisation of the Bureau of Entomology, the author made a tour of the United States, visiting all the more important research stations. He summarises his impressions in the preface by saying that the energy displayed in the U.S.A. in the struggle against insect pests is far greater than we in Europe, and especially in Germany, are inclined to adopt. The book is divided into three parts:—(1) An account of the organisation of the various departments of the Bureau of Entomology; (2) a description of the methods adopted, with special reference to the campaigns against the San José and other scale-insects, the cotton-boll weevil, etc.; the introduction and cultivation of various parasites and natural enemies of insect pests and the employment of mechanical and chemical remedies, spraying and fumigation. In part (3) the author under the heading, "What can we learn from America? Proposals for reform," sets out what he thinks ought to be done in Germany to bring the study and utilisation of applied entomology up to the same level as in the United States.

Applied entomology in Germany is, he says, in comparison with other sciences entirely in the background, and has been too long regarded as an unprofitable branch of knowledge, whereas the very contrary is the case. He gives a list of the principal research stations in Germany and a brief summary of the work done by them, and complains of the want in most of them of competent teachers of applied entomology and of experts in plant diseases; the instruction, though good of its kind, being for the most part in the hands of pure zoologists and botanists. In many cases he declares the personnel to be quite insufficient for the work to be done. The author seems to regard the Forestry schools of Germany as the best equipped and the most active in this direction and gives a summary of work done by them from 1907 to 1912. He makes the same complaint as regards the

German colonies, that there are but few research stations, and that the number of persons having the requisite practical knowledge attached to them is utterly insufficient and unworthy of a nation with the scientific reputation of Germany.

The importance to agriculture of a knowledge of economic entomology is such that there should be attached to every agricultural college a professor of phytopathology, with a zoological and a botanical assistant; the number of practical schools should be increased, and active steps should be taken to raise the level of the study of entomology in this connection. The Imperial Biological Institute at Dahlem could turn out a larger number of entomologists, who should be sent to and maintained in the various districts where their services are most required, after the fashion of the "Field Stations" of America. The author quotes Brauer to the effect that even the existing institutions are unable to supply the information asked for by governments, doctors, veterinary surgeons and farmers; or if they are able to do so, their very organisation causes delay and loss of time which is often such as to render the information useless when it arrives. Some well-organised method for the prompt distribution of useful entomological information is, the author says, urgently needed, as well as a large, practically informed and properly distributed personnel. He blames the pure zoologists of Germany for neglecting the practical side of their science. The author concludes with an outline scheme that after the completion of a course of pure zoology students should spend at least two terms, or better three, at an institution devoted to applied entomology, and that if possible, in addition, a visit to the U.S.A. should form part of the course, the cost of this latter to be borne by the State. He suggests the formation of a Society of Applied Entomology and has already taken some steps in that direction. An appendix of 17 pages contains a list of the more important publications of the U.S. Bureau of Entomology from which also the bulk of the illustrations are taken. The book contains a large mass of useful and well arranged information and provides an excellent summary of the subject.

**Cultivation of Tobacco for the Preparation of Fruit- and Hop-Washes.**
—*Jl. of the Board of Agric., London*, xix, no. 12, March 1913, pp. 985-994.

The high value of nicotine as an insecticide and acaricide has long been recognised, and there can be no doubt that if it were obtainable at a sufficiently low price it would be used to an enormous extent as a constituent of washes for fruit and hops and of sheep-dips. It poisons insects and related forms having soft delicate bodies, and has the great advantage that it does not stain the material sprayed. At present commercial nicotine costs about 15s. per lb. which makes its use impracticable in ordinary cases. The high price is partly due to the limited supply, but also largely to the cost of preparation and purification and the fact that the manufacture is hampered by fiscal regulations. Although there is no probability of any decrease in the price of the manufactured

product, there is good reason to believe that fruit- and hop-growers could, by growing suitable varieties of tobacco in such a way as to encourage nicotine production and by avoiding altogether the elaborate and expensive system of manufacture, produce their own nicotine washes at a cost low enough to enable them to compete with the cheaper but less effective and less desirable washes in common use. By Section 4 of the Finance Act, 1912, the Commissioners of Customs and Excise for the United Kingdom may authorise duly licensed persons to grow tobacco without payment of duty for the sole purpose of obtaining extracts to be used for purely agricultural and horticultural purposes, and the Board of Agriculture think it useful to publish some general information for the guidance of any growers wishing to avail themselves of this facility. It is found that the highest percentage of nicotine and the greatest weight of tobacco per acre are obtained from rank, coarse-growing varieties, treated in such a way as to encourage their tendency to strength of growth as much as possible. A great part of the heavy expense in the production of smoking tobacco is incurred in curing, grading and packing, nearly all of which is unnecessary in the case of tobacco grown as an insecticide and especially in the case of hop-growers who have an oast at their disposal.

The recommendations given in this article are largely based on the results of experiments conducted by the South Eastern Agricultural College, Wye, Kent, during the seasons of 1910 and 1911.

The type of tobacco best suited for the purpose is said to be *Nicotiana rustica*. The percentage of nicotine in a crop is found to depend very largely upon climate, soil, manuring and system of cultivation, and apparently the tendency to produce a high or low percentage of nicotine is an inherited quality of the plant. Smoking tobaccos are generally grown with a view to a low proportion of nicotine. Outline instructions are given as to cultivation, manuring, &c.; the method of extraction of nicotine and preparation of washes is exceedingly simple and the instructions are as follows:—The leaves should be broken up as finely as possible and then treated with three successive quantities of water in the proportion of 1 gallon to 1 lb. of leaves each time. It is best to allow one day for each extraction and the result is improved if the water be warm, but in no case must it be above 140° F. or nicotine will be lost by volatilisation. It is estimated that under good conditions 4 per cent. of nicotine in the leaves is not too much to hope for; this 3 gallons of extract, if made up to 5 gallons with water, will give a solution containing rather more than 0·075 per cent. of nicotine and at Wye this was found to be effective against the hop aphis. It is advised that the percentage of nicotine in the leaves be ascertained experimentally so that the proper strength of wash may be accurately obtained.

BUSSY (Dr. L. P. de). **Een Kleurmiddel voor Loodarsenaat.** [A Colouring Medium for Lead Arsenate.]—*Med. Deli Proefstation, Medan, Sumatra*, vii. Jan. 1913, p. 323.

The usual method of applying lead arsenate in powder is to mix it with tapioca meal and, as there is little or no difference in

the colour of the two substances, it is exceedingly difficult to know when they have been properly and thoroughly blended. The author finds that finely powdered wood-charcoal answers the purpose admirably and suggests proceeding as follows:—Equal parts by weight of the arsenate and the powdered charcoal are first thoroughly mixed, and this mixture is then added to the requisite quantity of tapioca meal to make the quantity and strength required, being thoroughly turned over until the whole is of an even gray tint: thus if a 4 per cent. mixture is needed, 4 kilogs. of lead arsenate are first thoroughly mixed with 4 kilogs. of finely powdered wood charcoal and the whole mixed with 100 (92) kilogs. of tapioca meal.

Bussy (Dr. L. P. de). *Opatrum* en "Oelar Kawat" in Deli. [*Opatrum* and "Oelar Kawat" in Deli.]—*Med. Deli Proefstation, Medan, Sumatra*, vii, Jan. 1913, pp. 317-322.

In 1912 this insect did a large amount of damage in many tobacco plantations. Previous to that date it had not been noticed as a serious pest, though it was observed in the season of 1907-8. The *Opatrum* found in Deli is very like the European species and is of a uniform black colour, though, whenever it is found in the open, it is covered with particles of earth and other material which render it exceedingly difficult to recognise. Dr. de Bussy describes another species, not yet determined, which seems likely also to become a pest in tobacco plantations, and both species are known by the natives as "oelar kawat." They appear to prefer a light rather than a heavy soil and are found on the hill estates over the whole east coast from Siantarsche to Boven-Langkat up to 300 metres above sea level. The beetles can be seen in the middle of the day running about on the surface of the soil in the burning sun, but they are also to be found hiding under flat stones, boards, branches of trees and the like, and they are easily collected by women and children. Their first attack on the tobacco takes place in the early part of the season and generally begins in January. In February and March they are more numerous and in April they are already beginning to disappear. It is possible that the Deli *Opatrum* may require a long period for its development and that the intervals between the outbreaks may thus be accounted for. The damage done is chiefly to young tobacco plants in the first fortnight after they have been planted out and the plants are attacked just at the point where the stem leaves the earth. The larvae make smaller incisions than the beetles, only below ground; occasionally they climb up the stem and damage it. When this is observed the plant should be pulled up, for though it may not appear at the moment to be suffering there is always a danger that it will ultimately succumb to fungus or bacterial infection through the holes made by the beetles.

As a remedy, smearing the young plants by hand with earth containing 10 per cent. of naphthaline has been found useful. The spreading of building lime over the ground has also been found to give good results. The insect is very difficult to poison, and baits poisoned with arsenic and strewn between the rows of

plants have been found to have no effect. The author says that he has as yet had no opportunity of observing the effect of dipping the young plants in a 2 per cent. emulsion of lead arsenate in water at the moment of planting them out, but he thinks that this method might prove serviceable. The method of hand-collection appears to be fairly satisfactory.

JOHNSON (Fred.) & HAMMAR (A. G.). **The Grape-Berry Moth.**—*U.S. Dept. Agric., Bureau of Entom.*, Bull. no. 116, pt. 2, 13th Dec. 1912, pp. 71, 22 figs. and 5 pls.

The Grape-berry Moth, *Polychrosis viteana*, Clem., has been known as a pest ever since 1868 in the vineyards of the Lake Erie Valley and was first described by Clemens in 1860. The authors give a résumé of the history of *P. viteana* in the U.S.A. and the evidence that it is a distinct species from *P. botrana*. It is a serious pest of the grape throughout the vineyard areas of the eastern United States. The larvae attack the blossoms and very young berries, occasionally burrowing into the stems and destroying a part of the cluster. The berries are connected by silky tunnels through which the larvae pass from one to another, and when they have attained full growth they abandon these webs and travel to the leaves, on which they pupate. The moths of the first brood deposit their eggs on the now nearly full-grown berries. The larvae of the second brood are usually much more numerous than those of the first and feed upon the pulp of the fruit and sometimes on the seeds before they commence to harden, though a single larva of the first brood may destroy almost an entire cluster by attacking the stem about the time when the grapes are in bloom. As a rule the larvae of the first brood rarely destroy more than 2 or 3 berries, and those of the second brood are much more destructive.

Laboratory observations were made upon 1,000 cocoons collected in the middle of May and from these 507 moths emerged by the end of July; the bulk of them in the last weeks of June. The moth appears not to lay eggs readily in confinement, but the average period between emergence and oviposition was found to be 6½ days and the oviposition continued for about a week. The length of life of the moth averaged about 13 days. The average period of incubation was 6 days; the feeding period about 23 days, though the range was great; and the pupal period 13 to 15 days, with a maximum of 23. The second brood eggs were laid in the last week of August; the period of incubation averaged 10 days, and the feeding period 40 to 52 days. The larvae leave the fruit between the 22nd September and the 14th November, and the author remarks that as the heavy shipment of Concord grapes does not take place until the 1st October, fruit in infested vineyard areas would have to be shipped during the first week of the picking season in order that any large number of the larvae should be removed from the vineyard with the crop.

Slingerland has reared six different parasites of *Polychrosis viteana*, viz., *Bracon scrutator*, Say, *Bathymetis* sp. near *terminalis*, Ashm., *Glypta animosa*, Cress., *Glypta vulgaris*, Cress.,

...ster (= *Apanteles*) *canatsiae*, Ashm., *Thymaris slingerlandi*, Ashm. The following additional parasites were reared at ... experiment station at North East, Pa., between the years ...-11. *Microbracon mellitor*, Say, *Microbracon dorsator*, Say, ...teles sp., *Ascogaster carpocapsae*, Vier., *Meteorus* sp., *Phytodietus* sp., *Epiurus indagator* var. *nigrifrons*, Vier., *Orthizema* ... *Haworgus nolae*, Ashm., *Dioctes obliteratus*, Cress., *Amelocentrus* sp. and *Itoplectis conquisitor*, Say, of which the most numerous were *Microbracon mellitor* and *Dioctes obliteratus*. In addition to the above in 1906 a large number of eggs of the Grape-berry Moth in a badly infested vineyard at North East, Pa., were found to be parasitised by *Trichogramma pretiosa*, Riley. This is the first and only record of parasitised eggs of this ... which has come to the author's notice.

The infestation of vineyards by this pest is by no means general and is frequently confined to one or two rows or to irregular patches. These infested areas generally adjoin hedgerows, fences or rough lands on which leaves and trash accumulate. On the other hand the worst infestation over the large area observed was in a vineyard remarkable for clean culture and excellent care. Adjacent vineyards are often comparatively free from infestation. This irregularity of attack causes the vineyard owners to neglect the insect or even to overlook it until picking time, and as a result, no combined operations for its eradication are undertaken. There is a certain area in the township of North East, Pa., in which the vineyards are heavily infested, though the same irregularity is observable, nevertheless the insect appears to be always present in sufficient numbers to become a menace at any time that natural conditions favour its rapid increase, and the author says that at the present time it is responsible for a greater reduction in crop yield than most vineyard owners are aware.

The following remedial measures are recommended:—The destruction of fallen leaves; ploughing the vineyard in late autumn or early spring; enclosing the grape clusters in bags; the removal of infested berries during the harvest season and the use of poison sprays. It is only within recent years that it has been known that practically all the overwintering larvae, instead of forming their cocoons upon the grape leaves attached to the vines, fall to the ground and make them on the relatively small percentage of prematurely fallen leaves. Some of these become plastered to the ground as a result of heavy rains and become quite rotten, so that their thorough removal together with the attached cocoons is a matter requiring some care, and ploughing, if properly done, is perhaps a simpler method than hand-picking; but loose leaves when dry are turned aside by the plough and not buried, so that the method is not always as effective as might be hoped. Enclosing the grape clusters in bags, which is done in some parts of New York State, primarily as a protection against rot, is expensive, and though effective can only be used for choice table varieties. Hand-picking the infested berries in July and early August reduces the numbers of the second brood. Infested green berries are conspicuous by the presence of a purple spot at the point of entrance of the larvae. These berries when

collected should either be thrown into boiling water or buried several inches deep. In late years it has become a common practice to pick and pack the fruit in baskets in the vineyard, the damaged berries being removed at the time of picking. These "trimmings" are frequently thrown on to the ground; they should be carefully collected and properly destroyed.

The author gives the results of a very large number of experiments with different poison sprays and different methods of application, and he says that the net result in the vineyards experimented upon was a great reduction in the quantity of damaged grapes and the infestation was very much less at the end of the third season of experiment than at the commencement. The irregularity of infestation, which has been referred to above, prevents any accurate determination of the real effect of the spraying, because in one part of the vineyard, the infested part, the action is direct and in the uninfested part prophylactic. The author says that in the present state of knowledge of the habits of the pest it is impossible to recommend any one method of control which would give thoroughly satisfactory results. Spraying frequently meets with only partial success and in some cases apparently fails entirely, possibly in these cases owing to insufficient application. He strongly recommends that spraying should be systematically tried for several consecutive seasons. The article concludes with a lengthy bibliography.

TOTHILL (J. D.). **Tachinidae and some Canadian Hosts.**—*Canad. Entomologist*, xlv, no. 3, March 1913, pp. 69-75.

The author has examined the breeding records of the Tachinid flies in the collection of the Division of Entomology at Ottawa, and finds amongst them 39 which, so far as he is aware, are new. These are set out with their hosts and comprise: *Blepharipeza*, 1 species; *Exorista*, 8 species; *Frontina*, 2 species; *Gonia*, 1 species; *Linnaemyia*, 1 species; *Masicera*, 3 species; *Phorichaeta*, 1 species; *Phorocera*, 2 species; *Plagia*, 1 species; *Sturmia*, 3 species, *Tachina*, 2 species, *Winthemia*, 2 species.

GIRAULT (A. A.). **Insects Injurious to Stored Grains and their Ground Products.**—*Twenty-seventh Report of the State Entomologist of the State of Illinois*, 1912, pp. 56-82, 12 figs.

The author says that over fifty species of insects live habitually or occasionally in stored cereals and cereal products in the U.S.A. but that only about ten of them are of the first importance. Seventeen are habitual grain-eaters, the remainder being more or less miscellaneous feeders. He describes and gives the life history of the following:—

*Sitotroga cerealella*, Ol. (Angoumois Grain-moth).
*Ephestia kuehniella*, Zell. (Mediterranean Flour-moth).
*Plodia interpunctella*, Hübn. (Indian Meal-moth).
*Pyralis farinalis*, L. (Meal Snout-moth).
*Tribolium confusum*, Duv. (Confused Flour-beetle).

*Silvanus surinamensis*, L. (Saw-toothed Grain-beetle).
*Calandra granaria*, L. (Granary Weevil).
*Calandra oryzae*, L. (Rice Weevil).
*Tenebrio molitor*, L. (Yellow Meal-worm).

*Measures of prevention.*—Granary insects, says the author, are much more easily kept out than put out. All store-places for grain or its products should be entirely free from cracks and crevices, and everything, not merely apparently but really, clean. Grain should be brought in from the field as quickly as possible and if found to be infested should be treated at once. He especially advises (1) that small grain should be threshed and stored as soon after ripening as possible, and if wheat has to be stacked that it should not be allowed to stand in the field longer than is absolutely necessary. (2) The granary should be thoroughly cleaned and fumigated with sulphur, if the presence of insect pests be suspected, some time before use and the rooms should be so built as to be practically gas-tight, with arrangements for thorough ventilation under control. (3) The desirability of artificial drying of grain at 125° F. for 4 or 5 hours is pointed out as effectively killing all insects. Seed-grain should always be artificially dried, as it keeps better and germinates more regularly. (4) Farmers, seedsmen and millers are urged when buying grain to see that it is free from insects.

*Treatment of infected grain.*—Mere cooling of the warehouse by opening the windows in winter will often prove very effective. If the insect attack be serious, then fumigation with carbon bisulphide or hydrocyanic acid should be employed. Detailed instructions are given for carrying out the operation with the latter. The exposure, if the place be really air-tight, should be for at least 18 hours and the gas required can be generated from 1 oz. of 98 per cent. cyanide in 1 oz. of commercial sulphuric acid (sp. gr. 1·83, 66° Beaumé) for every 100 cubic feet. Generally two thorough fumigations, 3 or 4 weeks apart, will be necessary to ensure complete success. Fumigation with carbon bisulphide may be used for grain in bulk, or for flour, without detriment to either, the liquid being applied with a spray apparatus to the walls and ceilings or by setting it in shallow pans hung near the ceilings. As the result of his own experiments, the author says that 10 lb. of bisulphide are required for every 1,000 cubic feet to be treated when the granary is properly constructed to hold the vapour. Very few granaries are so constructed and careful preparation for fumigation is therefore necessary. He gives an outline of the best method of construction and says that no one room should have a capacity of more than 15,000 cubic feet. Benzine and gasoline are recommended as contact insecticides.

*Use of cold and heat.*—Sudden and extreme changes of temperature are peculiarly fatal to insects, *e.g.*, a reduction from 50° to 0° or a rise from 60° to 100° will generally kill every insect in an infested mill or storage room. In Northern Illinois steam heat is applied by radiators and a temperature of 125° to 130° F. maintained for several hours; few insects can survive this treatment. The article concludes with a key for the identification of granary insects.

FORBES (S. A.). **What is the matter with the Elms in Illinois?**—*Twenty-seventh Report of the State Entomologist of the State of Illinois*, 1912, pp. 1-20, 4 figs., 6 pl.

The American white elm, the favourite shade tree in the towns of Illinois, is found to be subject to a fatal disease which is now prevalent throughout the State. The dry condition of the roots and the presence of borers in the trunk and larger branches seemed to point to the latter as the probable cause. *Saperda tridentata* Oliv. (the elm tree borer), and *Magdalis armicollis* Say, (the elm weevil), are the species generally found, the latter chiefly affecting dying trees. The evidence that the borers are the cause of the death of the trees is by no means conclusive and the author inclines to the view that the insect attack is secondary and that the real cause is neglect of the trees, which in the streets of towns are neither fed, watered, nor protected in any way and are often so trimmed as to invite the attack of insects; topping or pollarding, in the case of elms especially, should, he says, never be practised.

URICH (F. W.). **Rearing of the Vermilion Froghopper Egg Parasite.**—*Board of Agric. Trinidad and Tobago*, Circular no. 7, 1st March 1913, pp. 1-7.

The author describes the methods employed in rearing these Chalcidid parasites for the benefit of sugar-planters, and says that they are fairly easy and that any planter might carry them out in his house or office. They are based upon those in use at the Gipsy Moth Laboratory at Melrose Highlands, Massachusetts. In order to obtain the parasites in any quantity it is necessary to collect grass or cane trash from localities in which they are known to occur and to examine first whether there is any spittle among the roots; it need not be in large quantity; one or two adult froghoppers among the grass is also a good indication. The tufts of grass are taken up with the roots, but not with too much earth and all rotten or dry stalks should be carefully selected, as it is in this part of the plant that the froghopper lays its eggs by preference. The author describes the breeding boxes and says that as the grass is collected in the field it should be placed in the boxes in fairly loose layers and should not be packed too tightly as this prevents the parasites from coming to the top. The grass should be left in the boxes for at least six weeks and there is no necessity to moisten it. As soon as the parasites are hatched they at once make for the light and enter the tubes from which they should be removed as soon as possible. They should then be allowed to run into small glass tubes about ⅜ of an inch in diameter and 1¾ inches long, in which a piece of dry trash containing froghopper eggs has been placed. They should be fed every morning with a small drop of thin sugar and water; as much as the point of a fine insect pin will take up. In order to obtain froghopper eggs for the parasite, froghoppers should be confined in fairly large lamp chimneys, the ends of which are tied over with a piece of muslin or cheese-cloth. They should be provided with fresh green para grass every morning and a few dead para

... leaf sheaths which are almost rotten should be placed in ... lamp glass, for it is on these that the eggs will be laid. The ... chimneys should be kept in a dark and shaded place.

The trash containing the froghopper eggs which have been ... sitised should be kept moist as soon as the parasites are all ..., and the moisture may be allowed to condense on the interior ... the tubes. But when the time approaches for the emergence ... Chalcidids such moisture must be carefully removed, other... the parasites, which are very small and delicate, get ...ned; as soon as a parasite hatches it should be removed ... clean dry tube with fresh froghopper eggs. When possible, ... many as 6 may be put into one tube. The whole period of ...velopment occupies from 19 to 22 days.

Adult parasites should not be liberated in the cane and grass ...ds until a fair number has been accumulated, and they should ... reared for several generations under laboratory conditions. ... best time for releasing them is about a month after the begin... of the rainy season, as there is then every probability of ...ly laid eggs being present in the fields.

The author concludes with a warning to planters that the mere ...llection of grass and the distribution of it in the fields will not ...sperse parasites. No doubt parasites will issue from the grass, ... so also will hyper-parasites, and in breeding the parasites care ...st be taken that all of these hyper-parasites are killed.

...sso (E. O.). **Injurious and Beneficial Insects of California.**—*The Monthly Bulletin, State Commission of Horticulture, Sacramento, California,* ii, nos. 1 & 2, Jan. & Feb. 1913, 367 pp., 321 figs.

The authors says that this bulletin has been issued to meet the ...tinued demands for a full account of the economic insects of ...lifornia. Thirty-one pages are devoted to a catalogue of host-...ants and the insects which infest them. A brief description ... given of certain Arachnida which are injurious to plants, and ... outline of the various orders of insects, followed by an account ... the general appearance, life-history, distribution and food-...ants of each injurious species. Natural enemies, where such ... known to exist, are given, and the means of control, including ...secticides and methods of cultivation, together with mechanical ...pliances, wherever these latter may be required, are described. ...veral pages are devoted to methods of collection, mounting and ...servation of insects, and a quantity of useful formulae for ...rays and other insecticides is given. The various methods of ...migation and the apparatus required for carrying it out are ...cussed, the cyanide process being dealt with in considerable ...tail, and the book concludes with a reprint of the various ...arantine orders issued by the State of California. The volume ... profusely illustrated, there being no less than 282 illustrations ... photographs of injurious or useful insects and figures show... the nature of the damage done by them. There is also a ...ble showing the cost of the various articles required for fumi...ting operations and the approximate cost of various chemical ...d other products for spraying.

JONES (C. R.). **A New Coconut Pest.** *Promecotheca cumingi* **Baly.** *Philippine Agric. Review*, vi, no. 2. Feb. 1913, pp. 105-6.

A new insect belonging to the family HISPIDAE has been recorded as attacking coconut-palms. The injury caused by this beetle is not restricted to the larval stage, as the adult feeds upon the leaflets, slitting them longitudinally. The larva is a true leaf miner, even the pupa stage being passed within the tissue of the leaf. The eggs are deposited singly on the underside of the leaflets and generally on the lower leaves of the young palms, the female having previously eaten a small hole through the tough epidermis, so that the young grub can enter the parenchyma immediately upon hatching. The injury caused by the larva is greater than that caused by the adults; the combined attacks of both give the infested palm an unhealthy or blighted appearance. As yet the ravages of this beetle are more or less local, but it has been found from the Cagayan Valley in Northern Luzon to the Visayas in the south.

The author says that over 50 per cent. of the eggs, larvae and pupae are parasitised by a Hymenopteron, and were it not for this this leaf-miner would become rather a serious coconut pest. It is probable that it can be easily controlled by collecting and destroying the infested leaflets.

CLEARE (L. D.). **The Flour Moth and its Control.**—*Jl. Board of Agric., Br. Guiana*, vi, no. 3, Jan. 1913, pp. 130-137.

The author, in consequence of reports received, visited the warehouses of several large flour-importers in Georgetown and found many of them more or less infested by this pest, which appears to be especially partial to oats. The exact species to which the Georgetown Flour Moth belongs is still a matter of doubt. The adult seems to be near, but not identical with, the Mediterranean Flour Moth (*Ephestia kuehniella*), but the pupa resembles closely that of the Indian Meal Moth (*Plodia interpunctella*). The author gives a brief résumé of the history and distribution of this pest and careful details as to the method of clearing granaries and warehouses from it by the use of hydrocyanic gas. He recommends, in addition to the ordinary methods for applying cyanide, the "stringing" of the building, that is to say, that the bags containing the cyanide should be fastened to string passed through eyes overhead and the ends carried outside and fastened, so that at the proper moment the bag containing the cyanide can be lowered into the pot containing the sulphuric acid from the outside without any risk of danger to the operator. Ten ounces per 1,000 cubic feet of space is, he says, sufficient, if the building be fairly air-tight, and the fumigation should be repeated after 3 or 4 weeks if moths are still found in the building, which should not be opened for 24 to 36 hours after the operation is completed. With regard to fumigation with carbon bisulphide, he says that as the mixture of the vapour with air is highly inflammable and explosive, most insurance companies object to its use. The

... of the pest by fumigation in Georgetown is not very practicable on account of the mode of construction of the granaries; ... the most effective method would be by means of its natural enemies, *Amorphota ephestia*, Cam., and *Bracon (Habrobracon) ...*, Say, which he suggests should be imported from New South Wales, where they appear to keep the pest under control to a very large extent.

MARSHALL (Guy A. K.). **On New Species of Indian Curculionidae. Pt. 1.**—*Ann. Mag. Nat. Hist.* (8) xi, Feb. 1913, pp. 224-231.

The following species of economic importance are described:—*Hypera medicaginis*, sp. n., from Pusa, Bengal. Mr. Lefroy records this species as doing considerable damage to lucerne (*Medicago sativa*); *H. variabilis*, Hbst., has also been sent from the same locality.

*Apoderus sissu*, sp. n., from Pusa and Dehra Dun. Both Mr. Lefroy and Mr. Stebbing record this species as damaging sissu trees (*Dahlbergia sissoo*), which it defoliates.

HARRISON (J. W. H.). **Friends and foes of the Coniferae.**—*The Entomologist*, xlvi, no. 597, 1913, pp. 50-51, and no. 598, pp. 96-98.

The author desires to draw attention to a factor in economic entomology which has, in his opinion, been neglected and which is nevertheless of very great importance—that is, the value of the various Arachnids and Phalangids in holding in check insect enemies too small or too well protected to be dealt with by ordinary methods. Four woods were selected in various parts of the country for observation: the first, a mixed pine and larch wood; the second, larch, alder, pine and spruce; and the other two, spruce, larch and pine. The first wood was greatly infested seven years ago by the larch saw-fly (*Nematus (Lygaeonematus) erichsonii*) and the pines by the pine saw-fly (*Lophyrus pini*), but at the present time, although not completely exterminated, they have been practically destroyed by the ichneumon, *Mesoleius aulicus*, greatly assisted by a fungus. The saw-flies were aided in the work of destruction by the following lepidopterous larvae which were present in large quantities:—*Coleophora laricella*, *Phigalia pedaria*, *Gonodontis bidentata*, *Hybernia marginaria* and *Oporabia autumnata*. All of these, with the exception of *Hybernia marginaria*, were of sufficient importance to need special attention, but a succession of wet seasons had thinned out all except the *Coleophora* and *Phigalia*, both of which, especially the former, do an enormous amount of damage. The hibernated larvae of *Coleophora laricella* burrow into the young needles and injure them to such an extent that thousands of trees early in June looked as if blighted by frost. The pines too suffered from the

attacks of *Panolis piniperda*, the larvae of which could be beaten out in hundreds. This has also disappeared. In the same wood, as also in the second, *Lachnus pinicola* is very abundant, but kept under control by ladybirds, the principal of which are *Coccinella ocellata*, *Mysia oblongoguttata*, and *Adalia obliterata*. In spite of the work done by these parasites the larches in both woods are being killed off slowly but surely. In the first *C. laricella* is the cause, and in the second the woolly larch louse (*Chermes laricis*). These are not only destructive in themselves, but so weaken trees that they cannot resist the attacks of the larch fungus, *Peziza willkommii*, the spores of which enter at the points of injury. Affected trees seem to be at last attacked by *Sirex noctilio*, the large grub of which soon causes their final collapse.

The author thinks that neither *Sirex gigas* nor *S. noctilio* ever attacks sound trees. He has twice seen the latter ovipositing, and in each case the tree was dying. He strongly recommends that all nursery stocks of both spruce and larch should be sprayed in April and May either with petroleum and flour emulsion or lime-sulphur wash (the latter requires care in use), as he thinks that the pests are largely conveyed from the nurseries to the plantations. In beating these woods for beetles the author was greatly struck by the presence, in extraordinary numbers, of certain spiders, amongst them *Bolyphantes alticeps* and *luteolus*, and a supposed rare species, *B. expunctus*. This latter spins no webs, but lives on the twigs of conifers, devouring aphids, and probably also other insects. The author suggests that if this spider were transferred in quantity to woods of conifers in which it is not at present found, a great number of spruce and larch trees could be saved. It is exceedingly abundant in mixed spruce, larch and juniper woods in the north of Scotland, and in his opinion it would enormously assist the work of the Syrphids and Coccinellids in their attack on *Chermes*. As regards other spiders, which might possibly do effective work during the summer, he lays down the following conditions:—(1) They must be easily obtained; (2) they must be active and adult when *Coleophora laricella* is in the adult stage; (3) they should form an unbroken sequence to cope with other pests during the season; (4) they should be of arboreal habits.

He gives (p. 97) a list of such spiders with their habits, habitat, and the time of year at which they become adult. Many could be collected, he says, in large numbers from furze bushes and various shrubs by any intelligent woodman and liberated in woods infested by *C. laricella* to a dangerous extent. In order to discourage the spiders from spinning their snares too close to the ground, the wood should be kept clear of rubbish of all kinds, and this would destroy the breeding ground of a number of Scolytid beetles. It would further be well to limit the growth of heather for the same reason. The author was informed that in one of these woods the larvae of the Brindled Beauty Moth, *Phigalia pedaria*, was at one time present in sufficient numbers to affect the foliage of the larch, but it is hardly likely to become such a pest as *C. laricella*, for it emerges at a time when insect food is scarce and owls feed upon it greedily, its numbers being only kept up by the immense quantity of eggs laid by the wingless female.

**VAN SENGERKEN (H.). Beitrag zur Lebensgewohnheit von *Otiorhynchus rotundatus*, Siebold.** [On the habits of *Otiorhynchus rotundatus*, Siebold.]—*Zeit. Wiss. Insektenbiol.*, x, pt. 1, 15th Jan. 1913, pp. 7-12, 1 fig.

The author has found that nearly all the branches and twigs of *Syringa vulgaris* are attacked by this insect in the neighbourhood of Danzig. The beetles are nocturnal and exceedingly shy of light, and drop to the ground at the slightest sound, so that much care is required in order to capture them. They make their appearance in June and begin their work on the leaves of the syringas at once. They are greatly affected by temperature, very few being seen on cold nights. During the day they conceal themselves, but on very dark or cloudy days they will feed even in daylight, although slowly. The eggs appear to be laid on the roots of the host plant very slightly below the surface and the author found hibernating specimens of both sexes in the soil in January.

**Destruction des Insectes par les rayons ultra-violets.** [Destruction of Insects by the ultra-violet rays.]—*Journal d'Agric.-trop.*, 31st Jan. 1913.

It has been discovered by Mr. E. A. von Neustadt that the bluish light produced by incandescent lamps containing vapour of mercury, which is particularly rich in violet and ultra-violet rays, is peculiarly attractive to moths, and he has constructed an apparatus in which a lamp is placed in the centre of a circle occupied by a helix, which is made to turn rapidly by a small electric motor, thus producing a violent current of air. This current of air draws the insects that have been attracted by the light into a gauze cage, which, after the operation is complete, can be removed and immersed in tetrachloride of carbon. The whole apparatus is carried on a waggon, including the motor and dynamo. Experiments have been made with the apparatus in East Africa, near the cotton fields, and specimens of nearly every parasite of cotton were rapidly obtained. The cost of the apparatus is somewhat against its employment, but possibly, in the case of serious attack threatening the whole harvest, this, or some modification of it, might be of great service.

**The Destruction of *Albizzia* in Cairo.**—*Kew Bull. of Miscellaneous Information*, 1913, no. 2, pp. 94-95.

Mr. St. C. Feilder, chief gardener to the city of Cairo, states that until the summer of 1909 the city contained some thousands of "lebbek" trees, which formed shady avenues throughout the place. In the space of four years, three-quarters of these trees have disappeared, their destruction being due to the ravages of a species of mealy bug, *Dactylopius perniciosus*, which is capable of destroying the largest tree entirely in four months. Although it is only of recent years that this mealy bug has made its presence felt, it has doubtless existed in Egypt, unnoticed, for a number

of years. The insects can be found on almost every "lebbek" in the neighbourhood of Cairo, but it is only in the town that it has caused serious damage: for on the other side of the Nile, where the paths are not paved and the roads not tarred and where the trees are well exposed to the weather, the mealy bug, though present everywhere, has made no headway, and it seems therefore that the increase of the insect is determined by the state of health of the host. The attack begins in May, reaches the maximum in June and July, and begins to slacken in August.

Mr. F. C. Willcocks, Entomologist to the Khedivial Society of Agriculture has already published a full account of this pest (*Bull. Ent. Research*, i, 1910, pp. 121-137).

WARNER (H.). **The Cacao Beetle.**—*Proc. Agric. Soc., Trinidad*, Feb. 1913, pp. 89-91.

Besides the actual loss sustained in many plantations, the extension of cacao cultivation is greatly hampered in certain districts by the attack of this beetle (*Steirastoma depressum*, L.) on young trees, and there are districts in which, despite other difficulties, cacao could be grown, but the beetle destroys the trees to such an extent that attempts at cultivation are useless. In the six months to December 31st last, 32,627 beetles were destroyed on two estates and about as many in the previous six months, this work regularly employing the services of a small gang of men, and in no single month did they fail to catch large numbers.

The author urges that it is almost useless for one planter to expend money and labour upon getting his plantation clean if a neighbouring one is neglected. He complains particularly of wild chataigne trees being left rotting on the ground, as greatly assisting the breeding of the beetle. He cites an example of a piece of this wood which was overlooked on his plantation and which was only 12 ft. long and 6 ins. in diameter. This was found to contain 100 grubs and 20 cacao beetles in the pupa stage. He expressed the hope that every possible means would be taken, by means of drawings and lantern slides, and especially the plates from Mr. Guppy's pamphlet, to be used in schools all over the island, for the purpose of instructing the people generally as to the beetle and its habits, which, he says, are by no means sufficiently known outside the cacao plantations.

VAN HALL (Dr. C. J.). **Robusta and some allied Coffee Species [in Java].** *Agric. Bull., Federated Malay States*, i, no. 7, 1913, pp. 251-259.

The author says that the "bubuk" (*Xyleborus compactus*) is sometimes the cause of the loss of many branches, but it has always been observed that after a serious attack the insect disappears without special measures having been taken. It is apparently kept in check by its natural enemies, of which a small Chalcidid seems to be the most important. In some places the cultivation of *Coffea robusta* is rendered almost impossible by the attack of an

An anguillulid (*Tylenchus acutocaudatus*). Happily this enemy is not very common, and is confined to special regions. In late years the caterpillar of a Microlepidopteron of the family of TINEIDAE has done much damage to the blossoms and the clusters of young fruit, especially in the dry season, during the months of June, July, and August.

BALLARD (E.). **The Cotton Aphis.**—*Dept. of Agric., Nyasaland Protectorate*, Circular no. 1, 1913.

In Nyasaland continued rains and clouded skies are extremely favourable to the increase of the cotton aphis, although it is naturally controlled to a certain extent by ladybirds (COCCINELLIDAE). The only way to check the pest is by spraying with a contact poison as soon as the first colonies appear. The cotton crop should be constantly watched and measures taken at the first sign of attack, for if the winged forms are not kept down the cost will be enormously increased. Kerosene emulsion and tobacco infusion are found to be the best spraying materials in Nyasaland. The former has the drawback of expense, but the latter, though cheap, is not nearly so strong an insecticide as the kerosene. It has, however, been tried with success at the Bwaila Experimental Gardens. The "Four Oaks" knapsack spraying machine is recommended as the best apparatus; all the working parts are outside, and it is made of copper, so that it is not damaged by insecticides. With one machine two men should be able to spray four acres in a day, where only plants here and there have to be treated. Instructions should be given to the men to spray the underside and not the upperside of the leaves and stalks.

NOEL (Paul). **Les ennemis des Lentilles.** [The enemies of Lentils.] *Bull. Lab. Régional d'Entomologie Agricole, Rouen*, 1913, pt. 2, pp. 11 & 12.

The author points out that lentils might with advantage be much more largely cultivated as they are a good winter vegetable and make excellent forage for cows. He gives the following list of insect enemies of the plant:—

COLEOPTERA. *Apion ervi*, Gyll., *A. viciae*, Pk., *A. vorax*, Hbst., *A. craccae*, Hbst., *Bruchus granarius*, L., *B. lentis*, Boh., *B. pallidicornis*, Sch.

HEMIPTERA.—*Aphis pisi*, Kalt.

DIPTERA. Cecidomyid, No. 4110, Darboux and Houard, *Asphondylia ervi*, Rübs., *Perrisia viciae*, Kieff.

ACARI.—*Eriophyes plicator trifolii*, Nal.

NOEL (Paul). **Les ennemis des Melons.** [The enemies of Melons.] —*Bull. Lab. Régional d'Entomologie Agricole, Rouen*, 1913, pt. 2, p. 13.

The author complains that most of the melons put on the market have neither taste nor perfume, probably owing to the cost of

more careful cultivation, and the fruit is, he says, considerably damaged by *Aphis papaveris*, F., and by an Acarid, *Acarus telarius*, L., and also by certain Nematodes *Heterodera radicicola*, Greff, and by five species of fungi.

VUILLET (A.). **Description d'une nouvelle espèce et d'un nouveau genre de la famille des Phloeothripidae.** [Description of a new species and a new genus of the family Phloeothripidae.]—*Insecta*, no. 27, March 1913, pp. 77-84, 12 figs.

The author describes at length a new species discovered in the neighbourhood of Marseilles by M. H. J. Cotte in the deformed calices of *Dianthus caryophyllus*, L. A figure is given showing the unopened flowers of the carnation destroyed by this insect.

FORBES (S. A.). **Corn Root-aphis in Illinois.**—*Circ. Agric. Expt. Sta., Univ. Illinois*, 7 pp., n.d.

This aphis infests a great variety of plants, but corn, sorghum and broom-corn are the only crops on which it is found in Illinois for any length of time. It was once found by the author on the roots of wheat, growing on old corn ground, but corn is the only Illinois crop which it materially injures. It is quite at home on many wild plants and on several weeds which grow on cultivated land, especially smartweed (*Polygonum*), ragweed (*Ambrosia*), foxtail or pigeon-grass (*Setaria*), and crab-grass (*Panicum*). On these it thrives best in the early spring, but as they get dry in summer it prefers a rapidly growing succulent plant like maize.

Eggs are laid in the autumn and hatch in March or April, the young aphids being placed by ants on the roots of young field weeds; here they give birth to a second generation in 12-15 days, and these to a third in about as many days more. The time required for a generation to reach maturity shortens as the season advances, and in July and August may be as little as 6-8 days. The eggs hatched in spring yield only wingless forms, and, under the best possible conditions for the species, many successive generations may consist of wingless insects only; but if the plants become over-stocked by them, or if the weather becomes dry and the flow of sap diminishes, a variable percentage of each generation after the first may acquire wings and fly away. Wherever they happen to fall they are taken possession of by ants and placed as promptly as possible on the roots of plants capable of maintaining them. Up to this period all the aphids are viviparous females, but as the weather cools, the last generation of the season contains both sexes, and it is the fertilised females of this generation which lay the eggs by which the species is carried through the winter. Careful experiments have shown that there is in Illinois a minimum of 11 and a maximum of 22, or an average of about 16 generations in the year. The number of young produced varies very greatly according to the food the female obtains, varying from 20 to 98, with an average of 44.

The best time for attack on the root aphids would appear to be the spring, and, as they begin to hatch some time before any crop puts the ground in a condition to furnish food to the young, there is a period of from 2-4 weeks when they must get their support wholly from the young field weeds, which start from the seed in March or April, at just about the time when the winter eggs are beginning to hatch. Later the ants transfer the insects to the sprouting corn, so that the control of the weeds is a matter of some importance.

The ant requires almost as much attention as the aphis, because were it not for the care taken by the ants to protect and cultivate the aphis their numbers would be enormously reduced by natural causes. The best method of attacking the ants appears to be ploughing to a depth of 6 to 7 inches, and then repeatedly going over the ground with a disk plough to the same depth, and after the last disking the soil should be packed with a heavy roller. The time for these operations would very largely depend on the weather; most of it would be done in the early spring. These operations are of the greatest importance on land in which corn is intended to follow corn. In the experience of one large farmer, if this thorough, deep preparation of the ground for corn is kept up year after year, not only the corn root aphis, but most of the other corn insects will be gradually exterminated. The value of the method is shown by the greatly increased yield.

As a result of experiments with a number of substances, the author has arrived at the conclusion that bone-meal or any other powder fertiliser treated with oil of tansy, and then dropped on or very near each hill by means of a fertiliser-dropper attached to the planter, is very effective in driving away the ants. It is, of course, not necessary that the powdered substance should be a fertiliser. The following preparation was found useful: For each acre of land, 100 pounds of bone-meal thoroughly moistened with a quarter of a pound of oil of tansy, well mixed with one gallon of denatured alcohol or wood spirit. It must be remembered, however, that this is merely a secondary measure and will at best protect the ground only for a short time. It will not kill the ants or their young, but will keep them out of the corn hills, and if the weather should be wet it may be quickly washed away, though rain itself is one of the most fatal natural causes of the destruction of the aphis.

It is clear however, from what has been said above, that it is of great importance to kill the weeds in the early autumn before they have had time to ripen their seed, and that frequent rotation and late surface cultivation are important aids to the control of the corn root aphis.

Champion (G. C.). **An introduced West African Longicorn, *Cordylomera suturalis*, Chev.**—*Entom. Monthly Mag.*, March 1913, p. 63.

This insect has been found in a piece of so-called mahogany by a cabinet-maker at Gravesend. It is not by any means the first time that this Longicorn has reached England.

Stoner (D.). **The Harlequin Cabbage Bug in Iowa.**—*Entom. News*, *Philad.*, xxiv, no. 3, March 1913, pp. 132-133.

This pest, *Murgantia histrionica*, has been found near Iowa City, though no damage from these bugs has as yet been reported. The author says that although not common in Iowa it is clear that the range of the insect is being gradually extended through the Mississippi Valley.

Parrott (P. J.) & Hodgkiss (H. E.). **The False Tarnished Plant Bug on Pears.** *New York Agric. Expt. Station*, Circular no. 21, 4 pp., 1 pl. and 6 figs.

In certain sections of western New York this insect (*Lygus invitus*, Say) is very troublesome to pear-growers. The damage done by it has attracted attention for a long time, but very little has really been known regarding the insect. Experiments conducted by this Station have shown that it is amenable to spraying. The mature insect is very similar in appearance to the common tarnished plant-bug (*Lygus pratensis*, L.) which occurs on a great many wild and cultivated plants and is well known to many farmers. The newly hatched nymph attacks first the tender leaves of the pear, which become blackish about the points of injury; if feeding is extensive, the margins of the leaf become discoloured and shrivel up, the dead parts becoming detached later. The older nymphs attack the young fruit. A single nymph may stab a small pear many times, and though the original wounds are quite insignificant, they become very prominent and cause great disfiguration as the pear increases in size. Mature pears have the epidermis ruptured in various places, and these areas are hard and flinty and can only be cut through with difficulty with a knife. Pears which have been much punctured are usually undersized and much deformed. The extent of the losses due to the work of this insect varies in different orchards, and according to season; some orchards sustain more or less injury every year, and in 1908 a well known pear-grower estimated that 75 per cent. of his crop was damaged and half of it lost. The eggs hatch during the period when the trees are coming into blossom and hatching continues until the young fruits are about the size of filberts. In recent years the young nymphs have appeared in greatest numbers about the time when the petals begin to drop. The maximum damage is done in the month of May; in the first half of June the bulk of the insects are in the 5th or last nymphal stage and the mature or winged forms generally appear about the 2nd or 3rd week of this month. The adults remain on the trees among the succulent growth and on the fruit for a short time after their emergence, and then disappear from the orchards. The best remedy appears to be spraying just after the period of blossoming, and treatment should not be delayed until injuries commence to show themselves on the young fruits. The Station authorities found that ¾ of a pint of tobacco

extract "Black Leaf 40" to 100 gals. of water to which 3 lb. soap has been added gave the best results. The trees should be drenched and special pains taken to wet both surfaces of the leaves. Some growers have combined the nicotine extract with dilute lime-sulphur containing arsenate of lead, as applied for codling moth, with equally satisfactory results on both insects and foliage, and by this means avoided the necessity for an extra spraying. But as there is danger of burning pear foliage by drenching the trees with lime-sulphur, the authors advise a special treatment with nicotine and soap to combat this particular pest.

PARROTT (P. J.) & HODGKISS (H. E.). **The Pear Psylla.**—*New York Agric. Expt. Station*, Circular no. 20, 8 pp., 7 figs., 2 pls.

The pear psylla is one of the principal enemies of pear orchards, and in some parts of New York State is perhaps the most destructive insect pest of this fruit. The injury done at the end of May or early in June is usually attended with more serious consequences than that occurring later, the growth of the trees being severely checked. The leaves become stunted and discoloured, owing to the extraction of the plant-juice or of sun-scalding from the collection of honeydew on the leaves. If the attack is of long duration the leaves drop, and in some seasons the trees are completely defoliated.

In western New York the eggs are usually to be found about the first week in April, that is about a week after the flies emerge from their winter quarters, and in some seasons are so abundant as to cause the bark to have a yellowish appearance in spots. When the insect has accomplished its 5th moult it is a flat oval creature of a brownish colour, with whitish or greenish mottling, and with conspicuous dark brown wing-pads; these are known to most pear-growers as "hard shells." The adults live through the winter hidden in crevices under the loose bark of the trunks and larger branches, or under fallen leaves, &c., on the ground. Oviposition is greatly interfered with by bad weather and it may, in consequence, be very prolonged. The largest number of nymphs is generally found on the trees about the time that the blossoms drop, and they usually attach themselves to the axils of the leaves and at the bases of the fruit stems. Two or three days after hatching the nymphs cover themselves with honeydew. Successive generations of nymphs occur during the summer at intervals of approximately one month. The period of incubation of eggs of the summer broods is shorter than that of those deposited by the flies, and averages about 10 days.

The pear psylla has several insect enemies which have a considerable effect in keeping it down, ladybirds and a species of lace-winged fly being the most common and efficient. A parasite develops within the bodies of the host and destroys many of the nymphs; this parasite appears to be very widely distributed, but

the author does not give any details as to its nature or mode of operation.

The hibernated adults, the first brood of eggs and the newly hatched nymphs are the most susceptible to spraying, and it has been proved that if this be thoroughly carried out the pest may be practically destroyed. In order to be thoroughly effective the spraying should be done during warm weather, preferably in November and December or during March and early April. A rise in temperature induces the insects to emerge from their hiding quarters and creep to the portions of the trees exposed to the warm rays of the sun and protected from a cold wind. The insects are very sluggish in their movements and do not fly, and this facilitates thorough spraying. Experiments have shown that it is wise to spray one tree very thoroughly *before* proceeding to another. In warm weather the flies can move fast enough to get round from one side of the tree to the other, so that if a row of trees be sprayed first on one side and then on the other large numbers of the flies may escape. Care should be taken to select days for the work when there is no danger of the spraying mixture freezing on the trees. The best mixture is said to be $\frac{3}{4}$ pint of "Black Leaf 40" to 100 gals. of water to which 3 to 5 lb. of dissolved soap have been added. It is well, before spraying, to remove carefully all loose and rough bark; this has the double advantage of discouraging the flies from wintering on the trees and of facilitating the application of the spraying mixture. The eggs about to hatch and the newly-emerged nymphs succumb to an application of the lime-sulphur mixture, lime-sulphur solution (32° to 34° B.) 1 gal., water 8 to 9 gals. Most growers spray before April for the San José scale, but by postponing the treatment of pear orchards until the blossom clusters are well advanced, one may deal another effective blow against the psylla, and with the same treatment, successfully combat the scale. The spraying should be liberal, and pains should be taken to wet all portions of the tree especially the fruit spurs and the undersides of the young wood, where most of the eggs are laid.

The first brood nymphs, which are largely assembled in the axils of the young leaves and fruits during the latter part of the blossoming period, can be satisfactorily destroyed by spraying with the tobacco mixture (*see* above) just as the blossoms drop; and again in late summer; a thorough spraying will do much to save the necessity for the winter treatment. With careful work the authors say that it is not necessary to carry out all these measures each year, and some growers have entirely controlled the psylla by attacking hibernating flies only. Kerosene emulsion (kerosene 2 gals., whale or fish oil soap $\frac{1}{2}$ lb., soft water 1 gal.) has been successfully used for summer spraying against the nymphs, by diluting the emulsion in the proportion of 1 gal. to 8 of water. They attribute the frequent failure among growers to protect their orchards from the psylla chiefly to the lack of a definite system of treatment, because of the belief that the pest is periodical in its attacks, which has been repeatedly shown to be a fallacy.

DUPONT (P. R.). **Notes sur quelques Cochenilles (vulgairement appelées poux) qui attaquent le cocotier et autres plantes de grande culture à Mahé (Seychelles).** [Notes on certain Coccids which attack the coconut palm and other plants cultivated on a large scale at Mahé (Seychelles).]—*Bull. Soc. Belge d'Etudes Coloniales*, no. 2, Feb. 1913, pp. 164-167.

So far back as 1905 the author drew attention to the great damage caused by COCCIDAE in many parts of the Seychelles. The prolonged drought, which lasted for seven years and only ended in November 1911, was followed a few months after by the appearance of these insects. Fortunately their fungus parasites have appeared in great numbers at the end of the rainy season.

Seven species of *Lecanium* are mentioned as known in the Seychelles:—

*Lecanium (Saissetia) oleae*, on "La fouche" (*Ficus rubra*, Warb., var. *sechellensis*, Baker).

*Lecanium (Saissetia) nigrum*, on *Hevea* and *Hibiscus*.

*Lecanium (Coccus) hesperidum*, on *Cassia*.

*Lecanium (Eucalymnatus) tessellatum*, on "veloutier" (*Tournefortia argentea*, Linn. fil., and *Scaevola königii*, Wahl.), coffee, coconut and cinnamon.

*Lecanium frontale*, on "filao" (*Casuarina equisetifolia*, Forst.).

*Lecanium (Coccus) viride*, on coffee, citron, lemons, oranges and "buissons ardents" (*Ixora grandiflora*, DC.).

The author says that there is no difficulty in propagating a certain fungus by which the scale-insects have been attacked during last year, and which has been identified as a species of *Hypocrella*. The simplest plan is to attach to the infested trees leaves or twigs bearing scale-insects attacked by this fungus. Another plan, which requires more care but gives much better results, is to make pure cultures of the parasite and scatter the spores on the leaves of the trees which it is desired to infect, by means of a spraying apparatus made of tin; copper must not be used, because of its fatal action upon the fungus.

*Lecanium viride*, which is said to have caused the disappearance of almost all the thorn-bearing trees in the Colony, is attacked by *Cephalosporium lecanii*; while another fungus, identified as a species of *Microcera*, has been found to infest *Diaspis pentagona*, which damages the leaves of plum trees and the trunks of papaws (*Carica papaya*, L.).

Another Coccid, *Aspidiotus ficus*, is said by the author at the present time to be causing very considerable damage to young coconut palms almost everywhere throughout the group, and in the west of Mahé to be also damaging adult palms. This Coccid also attacks roses and the false sago palm. The leaves as well as the fruits are infected with such rapidity that in a few months the young coconut palms may be killed, and the vigour of older trees diminished considerably for several years. As yet, no fungus parasite appears to attack this Coccid, and all that can be done is to inspect all the plantations carefully and to destroy every leaf which is found to be infested and also all fruits gathered from the

infested trees. The latter are easily recognised, because the leaves in the middle of the crown, though still young, are withered at the extremities and have a characteristic appearance.

**Insect Pests in British Guiana.**—*Jl. Board of Agric, Br. Guiana*, vi, no. 3, Jan. 1913, pp. 153-4.

The following are reported as having been received from correspondents: The larvae of *Papilio anchisiades*, Esp., feeding on lime trees; larvae of *Pieris (Pontia) monuste*, L., feeding on cabbage; larvae of the hawk-moth, *Xylophanes tersa*, Drury, feeding on *Pentas rosae*, and previously recorded from soursop (*Anona muricata*); grubs of the Dynastid beetles, *Ligyrus ebenus*, de G., and *Phileurus didymus*, L. (*bajulus*, Castn.), attacking sugar-cane; *Lecanium (Saissetia) nigrum*, Nietn., from rubber trees; the orange snow scale, *Chionaspis citri*, attacking *Tephrosia purpurea*.

WILSON (H. F.). **Insect pests in Oregon.**—*Report of the Dept. of Entom., Oregon Agric. Coll. Expt. Station, Corvallis, Oregon*, pp. 81-121 of Biennial Crop Pest and Horticultural Report, Jan. 1913.

The author gives a popular treatise, illustrated with five plates, on the plant lice attacking orchard and bush fruits in Oregon. An account of the Shot-hole Borer or Pear Blight Beetle, *Xyleborus dispar*, F., contains a history of the insect, and details its distribution in Europe and the United States. The author remarks that at the present time the infested territory is increasing very rapidly, and that the insect will in time undoubtedly spread over the entire western part of the State. A list of fruit and forest trees known to be attacked is given, although the author says that it is far from complete. The article contains an extensive bibliography of this insect from 1781 to 1910. The smaller Shot-hole Borer, *X. saxeseni*, Ratz., is also described; but this insect is believed only to attack dying trees.

The Codling Moth, *Laspeyresia (Carpocapsa) pomonella*, L., is next dealt with, and the author warns intending planters of orchards against the supposed existence of immune regions, saying that wherever the apple tree will grow the Codling Moth will thrive. Special directions for dealing with the pest suitable to climatic conditions in Oregon are given.

The next article is on the San José scale, *Aspidiotus perniciosus*, Comst., which is published, the author says, rather to meet the demands of cultivators than to add anything to our knowledge. He regards lime-sulphur spraying as an entirely efficient remedy.

Tent Caterpillars, *Malacosoma erosa*, Stretch, *M. pluvialis*, Dyar, *M. constricta*, Stretch. The first and second of these are said to feed upon almost everything except the pear tree. The third will devastate whole groves of oak, especially *Quercus garryana*, occasionally migrating to the prune and causing alarm

orchard-owners. During the past two or three years *M. placidus* has been extremely abundant in the west of Oregon on some fruit and forest trees, the damage done in many cases being very serious. The Brewers' Blackbird, which is very common in Oregon, is very fond of the pupae and may be observed tearing open the cocoons and feeding on them. The artificial methods of control are similar to those in use against the Codling Moth.

The Cherry and Pear Slug, *Caliroa cerasi*, L., is a common pest of pear, cherry, plum and other fruit trees, and though not difficult of control causes considerable damage. Of four remedies used against this pest, white hellebore gave by far the most satisfactory results—1 lb. to 50 gals. of water. No foliage was injured, and the larvae were nearly all dead on the day following the application. Care must be taken that the material is fresh and free from adulteration. "Black Leaf 40" gave practically the same results and did not injure the foliage, but it is more expensive than the hellebore. Arsenite of zinc and arsenate of lead did not prove satisfactory, the damage to the foliage being somewhat serious at the strength required to produce any good effect upon the larvae.

LOVETT (A. L.). **Pests of Strawberries and small fruits in Oregon.**—*Report of the Dept. of Entom., Oregon Agric. Coll. Expt. Station, Corvallis, Oregon*, pp. 122-146 of Biennial Crop Pest and Horticultural Report, Jan. 1913.

*Otiorhynchus ovatus*, L., is described and figured, a list of the host plants both of the beetle and the larvae is given and the seasonal history discussed. As a measure of control the author proposes to take advantage of the inability of the beetles to fly and experimented with a barrier round newly-planted fields in order to keep them out. This barrier, consisting of a 12-inch board surmounted by a strip of tin, was unfortunately erected too late, and the experiment was only partially successful, but undoubtedly the number of weevils was considerably reduced. Spraying with a mixture of lead arsenate 3 lb., whale oil soap 3 lb., water 50 gals., was practised on the field inside the barrier and insects which had found their way into the field are said not to have touched the sprayed foliage. Such barriers would be of no use to orchard-owners who grow strawberries between rows of trees, nor would they be of use on land already seriously infested with the grub. The author considers the strip of tin unnecessary, and thinks a band of "tangle-foot" would be quite sufficient to keep out the beetles; the barrier should be in place by March 20th. Growers should, if possible, obtain new plants from uninfested districts only, and in any case should examine all received very carefully for adult beetles. A long list of spraying solutions is given, with a summary of the results of their application, for the most part unsatisfactory.

The natural enemies of *Otiorhynchus* have not, in the author's opinion, been sufficiently studied. He says that an immature Gamasid mite was discovered feeding on the eggs at Gresham,

Oregon. Domestic fowls feed on the larvae and pupae when allowed to follow the plough. Carabid beetles and their larvae are often found about strawberry hills, and at least two species of spider attack the adult beetles.

Other species of *Otiorhynchus* infest strawberries in the State of Oregon. *O. sulcatus* is reported as doing considerable damage, and also a larger species which is figured but not named. In the neighbourhood of Oswego, *O. rugifrons* is said to have an even greater capacity for destruction than *O. ovatus*, some growers having been compelled to give up strawberry culture entirely in consequence of its operations. The Strawberry Crown Miner, *Aristotelia* sp., is distributed over the whole State and does a considerable amount of damage, as does also the Root Borer, *Sesia rutilans*, Hy. Edw. In both cases the only remedy appears to be to dig up and destroy the infested plants.

The Currant Maggot or Gooseberry Fruit Fly, *Epochra canadensis*, Loew, is said to be possibly one of the most serious pests of these fruit trees in the State. One female may lay as many as 200 eggs, usually depositing only one egg on each fruit. The control measures suggested are the free use of insect nets in the mornings during June and allowing poultry to run through the bushes for a few hours each day to pick up the fallen fruit; this will materially lessen the next season's crop of flies. As the pest spends 11 months of the year underground, loosening the soil with a spade to the depth of 4 or 5 inches close to the bushes is useful; this will break up the pupal cells and expose the insect to unfavourable weather conditions and the attack of its enemies. Heavy mulching with straw in the spring has been suggested as preventing the flies from emerging. The use of poisoned sprays has been tried, but the results were not very conclusive, beyond the fact that the sweetened poison certainly attracted the fly. Mr. Malley has observed that in the case of the lead arsenate emulsion used as a spray, if the globules are too large the poison settles out and the flies are able to feed without obtaining any poison at all.

The Raspberry Cane Maggot, *Phorbia rubivora*, Coq., is reckoned as one of the serious Oregon insect pests, and the remedy suggested is to cut off the infested canes well below the girdle and to destroy them.

The cultivated blackberries and loganberries are occasionally injured by leafhoppers. Cleanliness in the plantations, the removal of all leaves, trash and rank grass, and spring ploughing, where practical, are useful preventive measures. Spraying, repeated twice or even three times, with whale oil soap, kerosene emulsion, resin spray (1 lb. resin and ½ lb. lye dissolved in 15 gals. of water) and "Black Leaf 40" were found to give good results. The author suggests that possibly sticky shields, constructed of heavy wires about 5 feet in length and 4 feet wide covered with oilcloth or canvas and smeared with crude oil or resin, dragged between the rows of bushes, might yield results that would be worth the labour.

The Cabbage and Radish Maggot, *Phorbia brassicae*, Bouché, is considered to be a very serious pest throughout the State of Oregon, and it also attacks most of the allied Cruciferae.

Ploughing the infested fields as soon as the crop is removed will materially lessen the next year's brood. The soil should be turned to a depth of four inches or more and all old stumps or refuse from the previous crop should be carefully removed from the soil. In the case of seed-beds the value of screens has been clearly shown, that is, wood and wire frames with cheese-cloth (20 threads to the inch) stretched over them. If properly constructed it is said that they will entirely prevent injury by the maggot, and they also have certain other advantages in hastening the growth of the plants which more than compensate for the cost. The use of tarred felt discs, described by W. H. Goff (Circular 63 of the U.S. Bureau of Entomology), is said to be very effective and at the same time cheap.

WILSON (H. F.) & LOVETT (A. L.). **Miscellaneous Insect Pests in Oregon.**—*Report of the Dept. of Entom., Oregon Agric. Coll. Expt. Station, Corvallis, Oregon*, Jan. 1913, pp. 117-165.

*Lepidosaphes ulmi*, L. (Oyster-shell Scale) is probably as widely distributed as the San José scale and causes great injury to fruit trees throughout the United States. In some parts of Oregon it is quite common and very abundant on unsprayed fruit trees. Its operations are supposed not to be so serious as those of the San José scale as it rarely kills entire trees, though single branches will become so weak that they will not produce fruit and may die. This pest not only attacks fruit trees but a large number of shade trees, vines and bush fruits. It has been said that lime-sulphur will not destroy the eggs of this pest, but the authors have observed that where this spray is consistently used against the San José scale the oyster-shell scale does not thrive and no extra application is needed, and they think that the insect can be held in check with this spray. In the case of shade-trees and bush fruits which are often so badly infested that spraying is necessary, kerosene emulsion applied just as the eggs are hatched in the spring seems to be the best. A high pressure spraying pump should always be used.

*Lecanium corni*, Bouché. The European Fruit Lecanium has only been found as a pest on prunes in Oregon, but in California it is known as the Brown Apricot Scale because of the serious damage done by it to apricot trees. Lime-sulphur is not very efficient against this insect and in case of serious attack the authors advise the use of what is known as the distillate oil emulsion spray, of which the following is the formula:—Hot water 12 gals., fish oil soap 30 lb., distillate oil (28° Baumé) 20 gals. The fish oil soap is made as follows:—Water 6 gals., lye 2 lb., fish oil 1½ gals. These boiled together for about two hours will produce 40 lb. of soap. The spray is made by taking 5½ gals. of the concentrated emulsion, adding to it 44½ gals. of water and 1 lb. of caustic soda to soften the water. The mixing should be as thorough as possible and is best effected by repeatedly driving it through a force-pump back to the reservoir or containing vessel.

*Tibicen septendecim*, L. (Periodical Cicada). The adults of this insect only appear in the northern United States at intervals of 17 years and in the southern of 13 years. Many insecticides are effective against this pest, but to be of real value they must be applied each day as long as the insects issue in numbers. Coating trees with whitewash or spraying with a strong solution of lime-sulphur offer possible means of preventing egg-deposition, as it has been stated that the cicadas do not like to sit on a white surface.

*Hemerocampa vetusta*, Boisd. (Western Tussock Moth). This insect is at present limited to the Pacific Coast and on account of the similarity of its work to that of the Tent Caterpillar is often taken for one of those insects. The authors say that there is little danger that this insect will ever become a very serious pest, but nevertheless at times it requires special attention. Contact sprays appear to be entirely useless and the only methods that offer any chance of success are either to collect the eggs or to place sticky bands on the trees and then jar them; the larvae drop and cannot get past the bands as long as they are kept freshly painted with the sticky material.

*Tischeria malifoliella*, Clemens? (Trumpet Leaf Miner of Apple). This insect is perhaps not of great importance to fruit-growers in Oregon, but occasionally it appears in very large numbers, as has been the case during the past 2 or 3 years. The damage done to the leaves by the larvae causes them to fall prematurely, thus interfering with the proper development of the fruit and the health of the tree. The best method of control appears to be to plough the orchards in the spring, burying as far as possible all the fallen leaves and trash, as it is in the former that the pupae pass the winter. This should be done not later than the time at which the trees are in blossom.

*Tmetocera ocellana*, Schlieff. (Eye-spotted Bud Moth). The larvae of this moth resemble those of the Peach and Prune Twig Miner sufficiently closely to be taken for them, but this latter attacks only stone fruits and the former confines itself almost entirely to orchard trees. Spraying the trees with kerosene emulsion in early spring before the buds open, or spraying with arsenical mixture when the larvae are feeding, are good remedies; if done in the first week of September, this will also help to catch a great many larvae of the Codlin Moth.

*Sanninoidea opalescens*, Hy. Edw. (Western Peach Root Borer). This has been reported only from four or five extreme western States. This is another insect so closely resembling an Eastern species as to be distinguishable only by the absence of a definite orange-coloured band across the abdomen. The habits of this Western species do not materially differ from those of the Eastern, both attacking trees to a greater extent in light sandy or gravelly soil, and peaches are most susceptible to attack, though prunes and apricots are almost equally favoured. Almonds, cherries, apples and native plums may be attacked. The Myrobalan plum is very little affected under normal conditions, and should be used as stocks upon which to graft the domestic plum. The Eastern agricultural authorities came to the conclusion that

washes and poisonous substances with a disagreeable odour were practically useless as preventives, but the authors say that good results have been obtained both from the use of whitewash and Paris green and by spraying the bark with thick Bordeaux mixture and Paris green.

*Magdalis aenescens*, Lec. (Bronze Apple Tree Weevil). Like many of the common insects found in Oregon, this appears to be a native of the north-west and has only been recorded from Oregon, Washington and British Columbia. Most of the feeding occurs in the bark and many growers have reported very serious injury to their trees. Careful examination of the bark and cutting out infested areas appears to be the most satisfactory methods of combating the pest.

*Rhagoletis cingulata*, Loew (Cherry Fruit Fly). During the last year or two enquiries have been made for remedies against maggots which destroy cherries. The larvae of this insect probably live about three weeks, the mature stage being reached just about the time the fruit is ripe, and as they remain in the fruit for a short time after it is picked, they may be distributed over considerable areas. The adults are not strong on the wing and can hardly do more than fly from tree to tree, or at the most from orchard to orchard. Many remedies have been tried but none of them has proved satisfactory.

*Syneta albida*, Lec. (Fruit Tree Leaf Syneta). This insect is reported as having done considerable damage for some time past. There are practically no published accounts of its habits and life-history. The adults appear suddenly in the spring, are very abundant for a few weeks and then disappear almost as suddenly. Larvae have been found at a depth of 14 inches below the surface. The serious damage is done by adults; when the blossoms open in the spring they feed on the petals. Later in the season the leaves of apples and prunes are the principal parts eaten, and trees will often have holes in almost every leaf. Perhaps the most serious injury is done to young grafts, especially where whole orchards have been grafted over. The operations of the insect in these cases frequently kills the tree. Various remedies have been tried but none has proved satisfactory. Young grafts can be protected by the use of cheese-cloth.

*Bembecia marginata*, Harr. (Raspberry Root Borer or Blackberry Crown Borer). This insect has made its appearance in certain of the bush fruit districts of Oregon and though at present confined to a limited area will undoubtedly spread and become a serious pest. The authors consider that birds are the best natural enemies of this insect, as they have been observed catching and feeding upon the adult moths. Possibly some sticky substance applied to the canes in early autumn might prevent the larvae after hatching from crawling down the stalks to enter the root. Many of the larvae may be collected in old canes and stumps during June and July.

*Epitrix subcrinita*, Lec. (Western Potato Flea Beetle). This is one of the very serious pests of the potato in Oregon. The summer generation, which really does the most injury, appears from the second week in July to the first week in August. There

are two generations in the season. The beetles from the autumn brood hibernate as adults and attack the crops in the spring. Spraying with Bordeaux mixture appears to be the only useful remedy. Various other insects are noticed, including *Ceresa bubalus*, F. (Buffalo Tree Hopper), *Notolopus* sp. (Western Canker Worm), *Oedemasia concinna*, S. & A. (Red-humped Apple Caterpillar), *Cacoecia rosana* (Oblique-banded Leaf-roller) and *Polycaon confertus* (Oak Branch Borer).

JEPSON (F. P.). **Some preliminary notes on a Scale-Insect infesting the Banana in Fiji.** *Dept. Agric. Fiji*, Bull. no. 5, Suva, 1913, 7 pp.

In September 1912 the inspectors of imported vegetable matter at Sydney and Melbourne respectively, called attention to the fact that bananas from Fiji were frequently found to be infested by *Aspidiotus hederae*, Vall., commonly known as Oleander Scale. In consequence of this report bananas in Fiji were inspected for scale before export and scales were found on the stalk-ends of some of the bananas, as well as on the stalk of the bunch and less frequently on the surface of each banana. Fruit from certain localities appeared to be much more seriously affected than from others, but few plantations were found to be free from infection. The scale had also been found in isolated cases on old leaves of Para rubber and commonly on leaves of the Kulava (*Wormia biflora*). This scale has now been definitely determined in Australia to be *Aspidiotus destructor*, Sign., and not *A. hederae* as first reported. It is known as the Transparent Coconut Scale. The species has been recorded as a serious pest of coconuts in Reunion, the Philippines, the Society Islands and the West Indies. The author quotes Banks' description of the insect *in extenso*.

When the Commonwealth of Australia refused admission to scale-infested bananas from Fiji, it was suggested (1) to spray the plants on the plantations; (2) to fumigate the bunches in the punts before shipping or possibly in the steamer itself; and (3) to dip the bunches in some scale-destroying mixture before loading them into the punts. As the Victorian authorities will not permit fruit which is marked with scale, dead or alive, to be offered for public sale, the second and third methods were not applicable to the bananas intended to be shipped to that colony, and it appears that the only method which can be recommended is a systematic course of spraying on the plantations while the plants are growing. Kerosene emulsion and lime-sulphur wash are recommended for this purpose.

O'Kane (W. C.). **Injurious insects. How to recognise and control them.** Macmillan Co., New York, 1912, 414 pp., 606 figs. Price 8*s*. 6*d*. net (2 $).

The insect pests described in this book are arranged in three groups as follow:—(1) Pests of garden and field crops, including pests of green-houses; (2) pests of orchards and small fruits; (3) pests of household, or stored products, and of domestic animals; this group comprises the common injurious species that do not feed on living plants.

Within each of the first two groups the species are arranged according to the place where they are found at work, thus insects within the soil are treated of first; then borers found within the stem, trunk or limb; then the pests feeding on the surface of the stem or trunk; then the leaf-feeders, and finally the insects attacking the flower or fruit. Many leaf-feeding insects are again grouped according to their general characteristics; caterpillars, sucking-bugs, etc., and the page headings are arranged so as to serve as an index to the place where the insect is found at work, and its general characteristics. The author has endeavoured so far as possible to avoid the duplication which is inevitable if an attempt be made to group pests according to host-plants. Fifty-one pages of the book with fifty-five illustrations are devoted to a general description of insects, their mode of spread, and their natural enemies.

Part II is devoted to means of control, and contains numerous formulae for insecticides in general use and methods of repelling insects from their food-plants. A general description is given of the principles of fumigation with carbon bisulphide, carbon tetrachloride, sulphur, hydrocyanic acid gas, and tobacco, together with the quantities required, and the methods of preparing Bordeaux mixture and lime-sulphur are carefully described. Sixteen pages are devoted to the details of spraying machinery, which is very fully illustrated.

Part III (pp. 107-379) deals with the insects themselves, their mode of operation, methods of control and remedies. As the book is intended primarily for the use of growers, no unnecessary scientific details are given under each insect, but in most cases in which it would be of practical utility, a figure of the insect with its larva is given, together with a photograph showing the nature of the damage done. If rightly used, this portion of the book should be of the greatest possible value to farmers and growers, as giving them at least some preliminary information as to the causes of damage to their crops, directing them as to the general methods by which such damage may be avoided or controlled and stimulating observation. A somewhat too short chapter is devoted to the insect pests of domestic animals. To those who have to deal with the whole subject of injurious insects, the table of references to the publications of the various United States Experiment Stations is extremely valuable.

The index to the book is very full, and as in it the pests are grouped according to the plants affected, there should be no difficulty, even to the uninitiated, in tracing the insect which may be damaging a particular crop.

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**The Turnip Mud Beetle** (*Helophorus rugosus*).—*Jl. Board Agric., London*, xx, no. 1, April 1913, p. 41.

Sickly turnip plants submitted to the Board for examination were found to be attacked by the larvae of the Turnip Mud Beetle. The edges of the young leaves were eaten, and pieces gnawed out of the upper surface of the swollen base of the leaves close to where they spring from the stem. The larvae were found quite in the heart of the youngest central leaves; these larvae were preserved and were found to bury themselves in the soil provided for them, and there pupated. This fact suggests that the attack of the Turnip Mud Beetle might be usefully followed by deep ploughing.

Bryden (H. A.). **Migratory Locusts.**—*The Field*, 18th Jan. 1913, pp. 139-140.

A short popular account of Migratory Locusts in Asia and Africa, with a description of some of the methods which have been found most useful for destroying them.

Porter (C. E.). **Notas para la Zoologiá Económica de Chile. Adiciones a la lista de los Cóccidos.** [Notes on the Economic Zoology of Chile. Additions to the list of Coccids.] *Rev. Chilena Hist. Nat.*, xvi, 1912, pp. 22 and 23.

Cockerell's catalogue of the Coccidae of South America (Rev. Chilena Hist. Nat., vi, 1902, pp. 250-257) gives only 10 species of Coccids for Chile and that of Fernald published in the following year 11. In the last 10 years most of the common species have been found throughout the country, as well as certain others which appear for the moment, at all events, to be new to Chile. Rivera described a further new species of *Aspidiotus* in 1905 and the author has demonstrated the existence in Chile of *Lepidosaphes ficifolii*, Berl., and *A. cyanophilli*, Sign. This last species was discovered on "Pacay" (*Inga reticulata*) during the author's official journey for the study of *Stegomyia fasciata*, in the valley of Tacna, and it has also been previously observed upon "Chañar" (*Gourliea decorticans*), in the valley of the Copiapó. The author gives the following list of the Coccids at present known in Chile. *Epidiaspis pyricola*, Del.Guer., 1894; *Aspidiotus cyanophilli*, Sign., 1869; *A. nigropunctatus*, Ckll., 1896; *A. osborni*, Curt., 1843; *A. rapax*, Comst., 1881; *A. riverae*, Ckll., 1905; *Aulacaspis rosae*, Bouché, 1834; *Fagisuga triloba*, Lindinger, 1909; *Icerya palmeri*, Riley & Howard, 1890; *Lecanium resinatum*, Kieffer & Herbst, 1909; *Lepidosaphes ficifolii*, Berl., 1908; *L. ulmi*, L., 1758; *L. becki*, Newm., 1869; *Pseudococcus citri*, Risso, 1813; *Pseudoparlatoria chilina*, Lindg., 1908; *Saissetia hemisphaerica*, Targ., 1867.

NEWSTEAD (R.). & CUMMINGS (B. F.). **On a remarkable gall-producing Psyllid from Syria.**—*Ann. Mag. Nat. Hist.* (8) xi, 1913, pp. 306-308, 4 figs., 1 pl.

A large, hollow, pod-shaped gall, containing an immense quantity of immature "mealy" Psyllids was found on a twig, probably of a tamarind, at Brumana, in the Lebanon. As only larvae and a few pupae were present, the insect cannot be described as a new species, but only as belonging to the sub-family TRIOZINAE. The size of the gall is characteristic, being larger than that of any known gall-producing Psyllid.

GOOT (P. van der). **Über zwei noch unbeschriebene Blattlaus-Arten.** [Two undescribed Aphids.]—*Tijdschrift voor Entomologie, 's Gravenhage*, lv, pt. 4, 24th Feb. 1913, pp. 319-332, 6 figs.

A list of tropical aphids, chiefly Indian, Assamese and Javanese, is followed by a description of two new species collected in Java in November and December 1909. *Macrosiphum montale*, sp. n., was found on the under side of the leaves of *Blumea balsamifera*, one of the Compositae, at Gunung Ungaran, 2,700 ft. The other new species, *Ceratophis insularis*, was found on a plant, the species of which unfortunately is not recorded, at Semarang.

BODKIN (G. E.). **Report of the Economic Biologist of British Guiana for 1912.** Georgetown, Demerara, 1913, 4 pp.

During the period under consideration a large number of visits were made to cultivations for the purpose of investigating cases of attack by insects. These included pests of sugar-cane, the moth borers (*Castnia licus* and *Diatraea*), the weevil borer (*Sphenophorus hemipterus*), the beetle borers (*Dyscinetus bidentulus* and *D. dubius*), also the sugar-cane mealy bug (*Pseudococcus calceolariae*); pests of rice, such as the rice bug and sundry Lepidopterous larvae; pests of the coconut, such as the palm weevil (*Rhyncophorus palmarum*), and scale-insects (*Aspidiotus destructor*) and others. A number of cases of the bud-rot of the coconut palm were also investigated, as well as pests of rubber, such as Lepidopterous larvae consuming the leaves (mainly the hawk-moth, *Dilophonota ello*), and the attacks of small bark beetles (*Xyleborus perforans*).

The author says that co-operation against insect pests is very necessary; it is useless for one farmer to rid his land of pests if his neighbour allows them to flourish unchecked.

**The Black Currant Gall Mite.**—*The Field*, 1st Feb. 1913, p. 233; 8th Feb. 1913, p. 275; and 22nd Feb. 1913, p. 379.

The Black Currant Gall Mite (*Eriophyes ribis*) has been known for more than sixty years, and at times in certain districts has

done so much damage as practically to put an end to the commercial cultivation of black currants. Certain varieties, Baldwin and Boskoop Giant, are said to be immune, but this is unfortunately not the case. "Big bud" has been reported on red and white currants, but this is rare.

*Hand-picking* is successful on small plantations; dusting with unslaked lime and flowers of sulphur at the end of March, mid-April, and the beginning of May gives the best results, but it has been known to fail; smearing the bushes in January and again in April with fish oil or cart-grease also has its advocates.

Hand-picking should be done before the new year, about November or December, when the diseased buds are rounder than the healthy ones and often of a greenish shade instead of a deep red. It is impossible to clear the trees in one picking, for the buds do not all develop the mites at the same time, but one very careful picking in early December, with inspection every three weeks, should in time clear them. All buds must be burned at once and care taken not to infect healthy trees, for the mite may be carried on the clothing from one tree to another.

Johannsen (O. A.). **Insect Notes for 1912.**—*Maine Agric. Expt. Station, Orono*, 14th March 1913, 18 pp., 3 pls., 9 figs.

The author says that these notes deal for the most part with well known insects, but they are reported on because of their significance with reference to local conditions. The past year has been in some ways of unusual entomological interest. Spruce pests have been very troublesome, the Gipsy and Brown-tail Moths have continued to spread, and many scale-insects ordinarily of small account have been conspicuous by their prevalence in many parts of the State. On the other hand beneficial insects have increased. Syrphids and other predaceous insects have practically exterminated many species of plant lice over large areas. The scale-insects dealt with are *Aspidiotus ostreaeformis* (European Fruit Scale), *A. perniciosus* (San José Scale), and *Aulacaspis rosae* (Rose Scale) which is said not to be limited to the rose, but to thrive on pears, strawberries, raspberries and blackberries. In the State of Maine the two last-named were the principal sufferers in 1912. *Lepidosaphes ulmi* (Oyster-shell Scale) is the commonest apple scale in Maine. *Chionaspis furfura* (Scurfy Scale) is said to occur in Maine, but no specimens have been seen by the Station Entomologists. It occurs in New Brunswick, Ontario, Nova Scotia and Prince Edward Island, so that its presence in Maine would not be surprising. *Chionaspis lintneri* (Lintner's Scale) has been recorded upon alder, willow, birch, dogwood and shadbush, and has been found in New York, Massachusetts, Maine, Prince Edward Island and Quebec. *Gossyparia spuria* (Elm Scale), frequently mentioned under the name of *G. ulmi*, was very abundant in the vicinity of Orono in 1912, especially during the early summer on the trunks and around the pruning wounds of the American elms. The maples in the grounds of the University of Maine were seriously attacked by

*Phenacoccus acericola* (Maple Phenacoccus). The distribution of the insect is wide and its host plants are said to be maple, hornbeam, lime and horse-chestnut. *Phenacoccus dearnessi* was found on gooseberry at Brunswick, Maine. Experiments not yet completed show that this insect can thrive on young apple, elm and maple grown in greenhouses. A list of 31 synonyms of *Eulecanium corni* (European Fruit Lecanium) is given from Sanders (Jl. Econ. Entom. xi., 1909, pp. 428-447). *Pulvinaria vitis*,L., was obtained from maple twigs. The number of host plants is large. The author gives a table showing the differential characters of the scale-insects in the foregoing account.

Aphidae. Miss E. M. Patch remarks that *Prociphilus venafuscus* was only found in small quantity on *Fraxinus* and these were being vigorously attacked by their natural enemies. Late in the season apterous aphides, which were believed to be of this species, were abundant upon the roots of young Balsam Firs near Orono.

*Euvanessa antiopa* (Yellow-edge Butterfly) was more frequently received for identification by the Station in 1912 than any other single species and was unusually abundant. *Ctenucha virginica* (Virginia Ctenucha) was also exceptionally numerous. Many of the nests of *Euproctis chrysorrhoea* (Browntail Moth) received for identification contained only or chiefly dead caterpillars. The cause of death is not clear. Some parasites were reared from a few of the nests. *Porthetria dispar* (Gipsy Moth) is reported to be making its way northward in the State and egg-masses were numerous in the autumn near Portland. The Tent Caterpillars (*Malacosoma americana* and *M. disstria*) were unusually numerous and did much damage to the foliage of apple trees in neglected orchards, both were frequently found on the same tree. Parasitic flies, *Tachina mella*, were bred from a number of the larvae of both species. *Peronia ferrugana* (Birch Leaf Roller) has been abundant in the vicinity of Orono for several seasons. The Spruce Bud Moths, *Tortrix fumiferana*, *Epinotia piceafoliana* and *Recurvaria piceaella* have been found feeding on the leaves of red and white spruce.

A Chalcid (*Monodontomerus aereus*) has been found as a parasite of the Browntail Moth in various parts of the State. This species was imported from Europe and distributed in Massachusetts about six years ago by Mr. W. F. Fiske, and since that time has gradually spread, until now it has a wide distribution in northern New England. The females hibernate in the winter nests of the moth and do not attack the caterpillars, but are parasitic upon the pupae. As a period of about two months must elapse from the time of escape of the parasites from the winter nests, until the pupation of the Browntail Moth, the parasite must live in the open during the interval. There appears to be but one generation in the year. The eggs are laid in the pupae in June, and the mature females seek shelter in the autumn in the new winter nests of the young caterpillars. The present method of destroying the Browntail Moth nests in midwinter, though effective against the caterpillars, also destroys the parasites, and some modification is necessary in order to preserve them. The

nests should be removed from the orchard or shade trees during the winter, but should be kept under normal outdoor conditions until the first warm days of spring, when both parasites and caterpillars become active. As the parasite is the first to emerge the nest could be destroyed as soon as the caterpillars are seen to be actively congregating on the outside. The nest as soon as cut from the tree may be placed in a barrel or other receptacle, the outside of which, at some distance from the top edge, should be smeared with a band of tangle-foot or some other similar preparation, so that if the caterpillars start to creep down the side they will be checked by the sticky substance. The parasite would fly off unharmed if the tangle-foot be not placed too near the upper edge. It is suggested that these barrels be placed in the vicinity of plantations in which Browntail nests are still known to exist. The parasites would thus aid in reducing the infestation in the woodlands as well as being enabled to breed and spread.

Another Chalcid, *Pteromalus egregius*, likewise imported about 6 years ago, has been gradually spreading northwards. This fly lays its eggs upon the caterpillars after they have become dormant. The developing larvae then feed externally upon the caterpillars and are fully fed before the cold weather sets in. Transformations are completed in the spring, the adults leaving the web nests two or three weeks after the caterpillars become active. This parasite should be protected in the same way as the previous one, only in this case the barrels should be left longer before destroying the webs of the Browntail caterpillars. *Pteromalus puparum* was reared in large numbers from pupae of the Yellow-edge Butterfly on several occasions during July 1912, and from one pupa alone 87 specimens emerged.

*Haltica bimarginata* (Alder Flea-beetle) was very abundant in many places, destroying the leaves of *Alnus incana*. *Agriotes mancus* caused much trouble to corn crops. The larvae of this insect appear to have a great capacity for resisting insecticides. Several were placed in a jar with some grains of corn which had been specially heavily coated with arsenate of lead. Several days later, some larvae were seen each half buried within the grain, the shell of which was intact except for a small hole the diameter of the insect's body. A month later only the shells remained and all the wire worms were still alive and apparently healthy. Tobacco dust, lime and other repellents also proved ineffectual. The successful growth of Canada field peas in some of the infested plots gave the suggestion that crop rotation would be the solution of the wire worm problem and experiments were made in this direction. This species, which in the middle west is known as the wheat wire worm because of its depredations upon wheat, is also a pest there of Indian corn. The adult insect probably lays her eggs near the roots of grasses and the young hatching therefrom are supposed to require three years to complete the life-cycle. Pupation takes place late in July or early in August. The adults emerge from the ground in May or June, and there is reason for believing that the pupae soon transform into adults and that they hibernate underground in this form, and not as

pupae. Complaints were received of damage by the following:—*Hylurgops* (*Hylesinus*) *opaculus* (Elm Bark Borer) *Xyleborus dispar* (Apple Tree Shot Borer), *Oberea bimaculata* (Cane Borer) and *Leptura canadensis*. *Galerucella luteola* (Imported Elm Leaf Beetle) is apparently making its way in the State of Maine. Much of the work on elms popularly laid to the door of this species in Maine during the past two seasons, however, was done by the larvae of a blue *Haltica*. *Saperda tridentata* (Elm Borer) has done considerable damage to elms in the state.

QUAYLE (H. J.). **Some Natural Enemies of Spiders and Mites.**—*Journal of Economic Entomology*, vi, no. 1, Feb. 1913, pp. 85-88.

"Red spiders" [mites of the genus *Tetranychus*] exposed as they usually are throughout their lives on the surface of the leaves and fruit, and not being very active, are subject to the attacks of a considerable number of enemies. The ones considered in this paper were observed on citrus trees in Southern California, and include, apart from several species of Acarina, representatives of six insect orders, Neuroptera, Thysanoptera, Hemiptera, Coleoptera, Diptera and Hymenoptera. Some of the least known are:—

*Conwentzia hageni*, Bks. This Coniopterygid is one of the commonest enemies of red spider in the Southern California citrus section. It feeds on the mites both in its larval and adult stages. The eggs hatch in from 6 to 8 days, the larva completing its development in from 18 to 22 days, during which period it moults three times. All stages of the spider are attacked, including the eggs. In attacking the latter the mandibles are thrust through the egg-membrane and all the contents consumed, usually from a single puncture. The contents of spiders themselves are similarly devoured. One larva devoured 96 spiders in 16 days, another a total of 226 spiders during its development from hatching to pupation, or an average of 15 a day. When mature the larva selects a place on the under side of the leaf, usually along the mid rib, for pupation. Thirteen days are spent as a pupa, when the familiar greyish white "dusky wing" emerges.

*Oligota oviformis*.—This species of rove beetle (STAPHYLINIDAE) occurs on citrus trees throughout the Southern California section. The light orange-coloured egg is laid singly on the under surface of the leaf. In 7 to 9 days the larva emerges and with its sharp pointed mandibles punctures a spider about the middle of the body, the body contents being sucked out by a pump-like action. As most of the body juices of the spider are absorbed they are spewed back again and the spider, which has been made transparent by the removal of the contents, resumes its normal red colour and rigidity. This pumping back and forth is repeated two or three times. Records of the feeding of the larva show that it will consume about twenty spiders a day, or from 200 to 300 during the course of its development. The adults eat on an

average ten spiders a day, and the maximum adult life is 32 days, making a total of over 300 spiders.

*Scolothrips sexmaculatus*, Pergande, has been continually observed feeding on the citrus red spider and occurs most abundantly during the winter and early spring. Generally eggs and younger spiders are eaten, the spiders being mostly attacked just before the first or second moult. All stages of the thrips, except the pupa, have been observed feeding on the spiders.

*Stethorus picipes*, Csy. The commonest, in fact the only species of Coccinellid of any consequence found feeding on red spider. Its average duration of larval life is 20 days and during that time 189 spiders may be consumed, or an average of 6·7 per day.

*Arthrocnodax occidentalis*, Felt.—This is a Cecidomyid fly, the larva of which has been observed to feed on *Tetranychus mytilaspidis*, *T. bimaculatus*, and *T. sexmaculatus*, being most abundant on the last species, probably because they live in definite colonies and food is thus obtained with less moving about. When the number of these Dipterous larvae is large their effect on checking the spider is considerable. One larva consumed 165 spiders in 15 days, or 11 per day, another consumed 12 per day.

Of the other known enemies of spiders, one of the brown lacewings, *Hemerobius californicus*, is very voracious and eats large numbers of spiders during its development. Records show that one of these larvae ate 532 spiders in 17 days and another 897 spiders in 20 days or an average of 44 per day.

Though each of these insects consumes many spiders the latter appear annually in large numbers.

MOORE (W.). **The Maize Stalk Borer** (*Sesamia fusca*, **Hamp.**) **and its Control.**—*Agric. Jl. Union of South Africa*, v, no. 3, March 1913, pp. 419-428.

This, in the author's opinion, is the most serious pest of maize in South Africa, particularly on the high veld. It is frequently confused with the cut-worm and the maize-cob borer. The former does not bore the stem but cuts off the young plant shortly after its appearance above the surface. The cob borer is found on the cob of the maize, eating away the tender grain, and may be confused with the stalk borer as both species may be found upon the cob. The adult moth lays her eggs under the leaf sheaths in clusters of about 50 during the second and third weeks of November. These hatch in from 6 to 8 days and the larvae begin to feed immediately, and if at this time the top be pulled out of the plant and the leaves carefully unrolled as many as 25 to 100 young larvae will be found. Owing to the large number of larvae on the one plant, the food supply soon becomes limited, with the result that many of the larvae migrate during the night to other stalks; entering the new plants near the base and boring their way up through the centre of the plant, they destroy its heart and prevent any further growth. In bad years farmers frequently do not reap as much maize as they had sown. The larvae

reach full growth and pupate about the first or second week in January, the adult moth emerging in a fortnight or three weeks, when the maize plant is generally in tassel and the young ears are forming. The larvae of this second brood never succeed in doing so much damage as those of the first, though by boring into the stem of the plant they consume a large amount of valuable cattle food. Occasionally however they do considerable damage in the ear of the maize. When full grown, at the approach of winter, the larva seeks a sheltered place in the stalk, generally at the base just below the surface of the soil. Here it hibernates until late in September or early in October. The number of moths of the first brood in November depends upon the success of these hibernating larvae in passing the winter, and this is really the weakest point in their life-history. A pinch of "vaporite" placed in the funnel of each plant is claimed by the farmers in Natal to give very good results, but it is somewhat costly and in many parts the necessary labour could not be obtained sufficiently rapidly to make the treatment effective. Trapping is accomplished by planting some very early maize on which the moths will lay their eggs. This is cut by the first of December and the grubs destroyed by feeding the maize to stock. Late planting should always be adopted where possible. If planted in November the maize will not be up in time for the first brood of moths and they will either find other food-plants or die. Unfortunately this plan cannot be carried out in the colder parts of South Africa, as earlier planting is necessary in order to avoid frosts. Cutting maize for silage is a means of doing away with the stalk borer which might be more generally practised, for not only would it destroy the pest, but also the lives of valuable cattle might thus be saved in case of drought. The maize is cut for silage before the stalk borers have sought their winter quarters and they are thus destroyed. Another method used by some farmers with success is to harvest the ears, pasture the field, and then pull out all stalks that are not eaten and burn them. Unfortunately the labour required for removing the stalks is often more than the farmer can afford and they are left in the ground, in which case he is adopting one of the best methods for breeding the moths.

Large numbers of larvae have been found dead, black and dried up, in frost-bitten stubbles late in June. It was first thought that some bacterial disease was at work, but this was proved not to be the case, and from experiments that have been made it was concluded that the larvae had been killed by cold. Some larvae were found to have been destroyed by a Braconid parasite, *Stenopleura sesamiae*, and also by a small species of predaceous ant, *Dorylus helvolus*. Figures are given showing the number of larvae alive, those killed by cold, those destroyed by the parasite and those destroyed by the ant, under different treatment and at different periods. The maximum destruction done by the Braconid was found in stubbles examined on 11th October and the same field also showed the highest average of destruction by ants. The largest number of larvae killed by cold was found in stubbles examined on 8th October,

and the author has no doubt that the practice of exposing the stalk to cold and the action of parasites are valuable means of diminishing the pest.

Further observations were made on the effect of winter ploughing, and it was found that on the 30th December no moths had appeared, although they should have at least been out by the 30th November. When the plot was dug up in January, the stalks had all rotted and a few remains of empty pupal cases were found, but no other evidence of the presence of the stalk borer.

The author thinks that the result of these experiments goes to show that winter ploughing is a means of controlling the pest.

Lounsbury (C. P.). **Caterpillar Wilt Disease.**—*Agric. Jl. Union of South Africa*, v, no. 3, March 1913, pp. 448-452.

During December last attention was called to an insect disease to which the names "caterpillar wilt" and "insect cholera" had been applied, which caused a great mortality amongst caterpillars of various species, and it is possible that in a normal season it prevents the wattle bagworm (*Chaulioides junodi*) from becoming seriously abundant and accounts for this pest being less prevalent in rainy than in dry seasons. The symptoms are as follows: The caterpillar becomes inactive, ceases to feed and voids much dark-coloured fetid liquid matter. The posterior part becomes distended and caterpillars which are normally smooth and green present a lustreless and sickly appearance. The victim turns dark, becomes flaccid and the body contents, beginning from the posterior end, break up into a black liquid with offensive odour. When attacked, the caterpillar usually seeks an elevated position such as the top of an herbaceous plant, and at death remains clinging to its support by its anal or one or more of its abdominal prolegs, and in a few days only a dry and blackened skin remains. A disease of this general character has been ascribed by different writers in Europe and America to various organisms, but the author thinks there is much reason to question whether there is one principal disease or a number of diseases of different origin which produce somewhat similar effects on the victim. Whatever its nature may be, he is of opinion that the type which occurs in South Africa is unlikely to be excelled in virulence. In the lucerne fields it is not an uncommon sight to see almost every stem crowned by a dead or dying larva of *Colias electra* or of *Heliothis obtectus*, two very common and destructive pests of lucerne. Attempts made to propagate the disease in Europe and America by feeding caterpillars on leaves which had been soaked in water, are referred to at length and were repeated by the author on the above-mentioned lucerne caterpillars and with the pepper tree caterpillars (*Bombicomorpha bifascia*), which are common in the Transvaal, and in all cases the disease manifested itself.

Several instances are given of the destruction of caterpillars following the introduction of the virus into fields of lucerne, but the author has very little doubt that the success of at least one

of these experiments was much more apparent than real and that the disease probably existed already amongst the caterpillars. Apparently the fact that the disease can be induced in caterpillars by feeding them on wet leaves has been known for some time. A writer in one of the local newspapers stated that an excellent method of getting rid of them in a garden was to collect a few, feed them for a time on wet lettuce, and turn them loose, and the author thinks that after all this may be a simple and thoroughly effective method of dealing with the pest.

CIMATTI (V.). **Contro la Diaspis del Gelso.** [Control of *Diaspis* on Mulberry.]—*Rivista di Agricoltura, Parma*, xix, 21st March 1913, p. 187.

The author considers that insecticides are of no use against this pest, but if the trees have been well pruned in autumn and well brushed in winter, the next thing to be done is to disseminate the Chalcidid parasite, *Prospaltella*, over the mulberries. The material can be obtained from the Travelling Agricultural Schools or from the Royal Entomological Station at Florence. If the infection be properly spread he says that the orchard owners need have no care until the following autumn. The next autumn and winter they will be able to determine how far the pest has been destroyed. He suggests the following scheme of operations for those persons who have made use of *Prospaltella* in the past year. In the month of March several branches of the trees which have been well infected with the parasite should be cut and attached to trees which are attacked by the *Diaspis*; these trees will serve during the present year for the further spread of the *Prospaltella*. In the colder parts of Italy, *e.g.*, Piedmont, the results obtained from the Chalcidid are more perceptible in the second year of infection. All growers who have already made use of *Prospaltella* should endeavour to spread it as much as possible, and the author assures them that in a few years they may feel quite certain that the *Diaspis* will have totally disappeared.

SCELSI (S.). **La Diaspis Pentagona.**—*Rivista di Agricoltura*, xix, *Parma*, 17th January 1913, p. 42.

The author gives a popular description of the insect and the damage done by it, and says that it is more easily controlled in winter than in summer. If the *Diaspis* can be detached from the branch and made to fall upon the ground it dies, and he strongly recommends the use of steel gloves known as "Sabate or Targioni gloves" or wire brushes. Even this method does not succeed completely, because large numbers of *Diaspis* remain attached in crevices of the bark and thus escape the brush. All that remain are capable of laying eggs in the spring, and this must be either prevented or the eggs destroyed, which can only be done by injecting some insecticidal fluid with a pump into all such cracks and crevices. He gives the following formula:—Carbonate of soda, 450 grams; heavy oil of tar, 900 grams; water,

10 litres; to be thoroughly emulsified by frequent passage through the pump. The difficulty of maintaining the mixture has led to the use of a special liquid known as Professor Perroncito's Diaspicide, a one per cent. solution of which is said to answer every purpose.

COCKERELL (T. D. A.). **Two new Coccidae.**—*Journal of Economic Entomology*, vi, no. 1, Feb. 1913, pp. 142-3.

A new Coccid, *Drosicha lichenoides*, from the Philippine Islands, lives on the bark of *Ficus nota*, frequenting only areas covered with patches of whitish lichen, the colour of which it imitates so closely as to be almost hidden. It is commonly attended by an ant, *Dolichoderus bituberculatus*, Mayr, which led to its discovery.

On a species of *Agropyron* at Glenwood Springs, Colorado, a mealy bug, *Trionymus violascens*, sp. n., was found in considerable quantity.

BURGESS (Q. F.) & ROGERS (D. M.). **Results of experiments in controlling the Gipsy Moth by removing its favourite food-plants.** —*Jl. Econ. Entom.*, vi, no. 1, Feb. 1913, pp. 75-79.

For many years great efforts have been made to perfect mechanical methods for controlling the gipsy moth. In the earlier observations on this moth in New England the conclusion reached was that the larvae were general feeders and that practically all the trees or plants would suffer severe injury on account of being defoliated by them. In 1904-1906 large woodland areas were quite defoliated by these caterpillars in the Boston district. In 1907 it was noticed in many places that, where the gipsy moth defoliation had been severe, the larvae seemed to show some preference in the species of trees attacked. Thus white and pitch pine were not severely defoliated unless they were growing in or near an area of hardwood trees.

Observations showed that the gipsy moth caterpillars will eat almost any kind of vegetation, although they prefer the foliage of oaks, willows and apple trees. The ash, juniper and red cedar are practically immune from attack and maple is not injured to any great extent if more desirable food is within easy reach. Owners of woodlands are advised to cut timber of marketable size if the gipsy moth is prevalent in the region. The poor and worthless trees should be cut, leaving for reforesting purposes vigorous specimens of ash, maple, pine, or coniferous trees of which the insect is not specially fond. The planting and preservation of ash and hickory is recommended, as the wood is of high value and the trees are not subject to the attacks of brown-tail moth.

Details are given of various experiments in which forest areas were cleared of susceptible trees, only resistant species, such as chestnuts, pines, maples, etc., being left standing; in every case such thinning resulted in a very marked diminution of gipsy

moth attack. Some years must elapse before accurate data are at hand with regard to this question, in order to obtain complete information on the feeding habits of gipsy moth caterpillars in each stage and on all food-plants which are common in New England; present results, however, indicate that the oaks should be eliminated as rapidly as possible, and also grey birch, wild apple and willow.

CAMERON (A. E.). **A Note on Two Species of Bassid Ichneumonidae Parasitic on a Species of Syrphid Larva.**—*Entomologist*, xlvi, April 1913, pp. 130-131.

The author has bred a small species of Ichneumon, *Homocidus dimidiatus*, from pupae of a Syrphid fly, *Platycheirus albimanus*. Both the Syrphid and its parasite are on the wing as adults from May to September. The Syrphid hibernates in the larval stage, pupates in March, and the adults emerge in the beginning of May. Another Ichneumon, *Homocidus tarsatorius*, was reared from the same host.

WATSON (J. R.). **New Thysanoptera from Florida.**—*Entom. News, Philadelphia*, xxiv, no. 4, April 1913, pp. 145-148.

Seedlings of camphor (*Cinnamon camphor*) at Satsuma, Fla., suffered much damage from *Cryptothrips floridensis*, sp. n. Feeding on a fungus under orange tree bark, *Phloeothrips floridensis*, sp. n., occurred in the greenhouse of the Florida Experiment Station at Gainesville. On orange leaves were discovered numerous thrips closely resembling *Leptothrips asperus*, but differing in having large posterior ocelli and strong thoracic spines. For these the author proposes a new subspecific name, *acro-ocellatus*.

KLEINE (R.). **Lebenszähigkeit von Schmetterlingsraupen.** [Vitality of a lepidopterous caterpillar.]—*Zeits. Wiss. Insektenbiol.*, ix, 2, 15th Feb. 1913, pp. 59-60.

A caterpillar belonging to the genus *Agrotis*, included for a fortnight in the ice covering a pond in November, was thawed out, began to move its mouthparts after half an hour and attacked a cabbage-leaf soon after. The following day it apparently had entirely recovered.

SCHUSTER (W.). **Der Pfirsichbock, *Purpuricenus koehleri*, Fabr., im Mainzer Becken.** [The Peach Longicorn, *Purpuricenus koehleri*, in the Mainz Basin.]—*Zeits. Wiss. Insektenbiol.*, ix, 2, 15th Feb. 1913, p. 60.

In June this peach borer, otherwise a Mediterranean and South Russian species, may frequently be met with on diseased peach trees in the warm fruit district near Mainz.

GREEN (E. E.). **Remarks on Coccidae collected by Mr. Edward Jacobson, of Samarang, Java, with descriptions of two new species.**—*Tijds. Entomologie*, lv, pt. 4, 24th Feb. 1913, pp. 311-318, 2 pls.

The collection consists of only eight species, two of which are new, and all of biological interest. *Dactylopius (Pseudococcus) citri* is universally distributed and associated with an Aleurodid and ants (*Oecophylla smaragdina*) on *Loranthus*. *D. (Pseudococcus) maritimus* was found on the sea-shore of Krakatau and has been previously recorded only from California. Protected by its waterproof mealy secretion it may have been carried to the Malay Archipelago in the crevices of driftwood by the equatorial current. A more probable explanation may be the direct importation on living plants from California, and subsequent accidental distribution from Buitenzorg. The cosmopolitan species *Lecanium (Saissetia) hemisphaericum* was found, attended by the ant *Oecophylla smaragdina* on *Loranthus* and *Flacourtia*. *L. discrepans*, previously only known as a Singhalese species, was found associated with the same species of ant, at Semarang; as was the new *Lecanium optimum*. The ants construct protecting webs over the assemblage of COCCIDAE. In spite of this protection, the insects are parasitised by a Braconid, and are attacked by the carnivorous caterpillar of a moth (*Eublemma* sp.). *Eublemma* also attacks *Tachardia aurantiaca*, found at Semarang on *Flacourtia*. The second new Coccid is *Icerya jacobsoni*, occurring at Semarang on *Dombeya acutangula* and infested with larvae and adults of a small Coccinellid beetle.

SCHULZE (P.). *Scolytus geoffroyi*, **Goeze (Col., Ipid.) an Wallnuss.** [*Scolytus geoffroyi*, Goeze, on the Walnut.]—*Zeits. Wiss. Insektenbiol.*, ix, 2, 15th Feb. 1913, p. 59.

In a decrepit walnut tree felled in the garden of the Berlin Royal Mining Academy the burrows of a beetle were discovered which seem identical with those caused by *Scolytus geoffroyi*, usually considered to live exclusively on elms, and very rarely on ash and birch.

COURRET (H.). **Nos Colonies à Bovides.** [Our cattle-rearing Colonies.] *Bull. Soc. Nat. d'Acclimatation*, 1st Feb. 1913, pp. 73-76.

The author says that the pasturage for cattle in New Caledonia is not of the best quality. Great carelessness appears to have been shown in the past as to the choice of pasture herbage and no care whatever has been taken to provide forage plants from without, possibly because the locusts consumed everything. These insects have caused great damage in New Caledonia, not only to pastures but to other forms of cultivation, and the administration has awakened to the fact that something must be done to meet the pest. M. Escande, a cattle breeder, in 1896 made a formal

report on the subject of locusts, describing their habits and life-history in New Caledonia at length.

Considerable sums have been spent uselessly through not paying attention to the important consideration that locust hunting is only profitable from 12 to 15 days after the hatching which follows the cold season, that is to say from September to November. The General Council voted 20,000 francs for locust destruction on these lines, but in consequence of want of co-operation the results were not such as might have been expected. Some years later with better organisation, better results were obtained. Attempts were made to use the locust fungus from the Bacteriological Laboratory of Grahamstown, but with no success.

SEVERIN (H. H. P.). **Precautions taken and the danger of introducing the Mediterranean Fruit Fly (*Ceratitis capitata*, Wied.) into the United States.**—*Jl. Econ. Entom.*, vi, no. 1, Feb. 1913, pp. 68-73.

The author refers to the lack of precautions taken at ports along the coasts of California, Oregon and Washington against the importation of fruit from Honolulu. All fruits and vegetables bought in Honolulu for ships' stores are to be thrown overboard before the three-mile limit is reached, but this is a questionable precaution, for it has been shown that Mediterranean fruit fly maggots can develop into adult flies after immersion in sea water for 45 hours. *Ceratitis capitata* may be introduced into the United States from the Hawaiian Islands in pineapples and bananas, also in the wrappings. The latter are supposed to be burned on arrival, whilst all fresh pineapples for Californian ports are fumigated before they leave the dock. The author surmises that the chief danger of introducing the fly rests with travellers making a trip to the Hawaiian Islands who carry Hawaiian-grown fruit in their trunks into California.

NEWELL (W.). **Notes on the Rice Water Weevil (*Lissorhoptrus simplex*, Say), and its Control.**—*Jl. Econ. Entom.*, vi, no. 1, Feb. 1913, pp. 55-61.

*Lissorhoptrus simplex* is generally distributed and generally destructive, over the entire rice-growing belt of the Southern United States.

Cultivated rice is preferred as host and food-plant, and little difference is noted in choice between the Honduras and Japanese varieties. The adults prefer to feed on young plants. Infestation of the rice field by the adults is invariably co-incident with the first flooding. Howard mentions wild rice, bulrush, water lily and spatter dock as food-plants of the adults. In all rice fields where rice and *Paspalum membranaceum*, Walt., were interspersed, the adult weevils fed freely upon the leaves of both plants. They also fed upon another unidentified *Paspalum* which was found to have its roots heavily infested with the larvae.

This *Paspalum* is about the first grass to begin growth in the spring, occupying drainage ditches, shallow ponds and all places where shallow water is available.

The adults fly readily to artificial lights of all kinds, especially upon dark, warm nights. It therefore seems not improbable that lamp-trapping just before or during oviposition would possess value as a remedial measure.

The larvae, known to planters as "rice maggots," eat off the small, tender roots and rootlets, and injure the larger older roots by gnawing into them. As many as 4-8 larvae (or sometimes 10-12) may be found on the roots of one plant, and this will then present a yellowish, sickly appearance with some of the lower leaves discoloured and dead. From 35 to 45 days elapse from the deposition of the egg until completion of the larval stage. The duration of the pupal stage is unknown.

The only control measure used during the last thirty years has consisted in drawing off the irrigating water, with a view to destroying the larvae, a measure that is not always successful. As the adults feed upon the rice leaves before and during oviposition, it is suggested that they might be destroyed by the use of arsenical sprays, or by dusting the plants with powdered arsenate of lead.

DEAN (GEO. A.). **Further data on heat as a means of controlling mill insects.** *Jl. Econ. Entom.*, vi, no. 1, Feb. 1913, pp. 40-55.

If a mill be infested with the "confused flour beetle" (*Tribolium confusum*) and the other little rust red flour beetles, the "cadelle" (*Tenebrioides mauritanicus*) and the saw-toothed grain beetle (*Silvanus surinamensis*), the ordinary fumigation method of treatment is of little value, for these insects are found in cracks and in accumulations of flour inaccessible to any gas. The confused flour beetle and the cadelle are found in practically every flour mill in America, Southern Canada and Europe, and in their larval stages do an immense amount of damage.

During the summer of 1910, a 1,000 barrel frame mill in Topeka was given a thorough fumigation with hydrocyanic acid gas; yet a few months later the mill showed evidence of serious insect infestation. The following spring a second fumigation was given with the same gas; one month later insects were again causing trouble. During June, without any change or additional radiation in the heating system of the mill, the heat was turned on one Sunday morning and continued until nearly Sunday midnight. Examination showed that far more insects were killed than in the gas fumigations and a further examination several months later failed to reveal a single live Mediterranean flour moth at any stage. In another mill, during the summer of 1910, fumigation with hydrocyanic acid gas was tried and before the summer was over not only were the common mill insects becoming abundant, but the Mediterranean flour moth was doing serious injury. The following summer the mill was heated from one

Sunday morning to midnight and next day no insect escaped death on the floors where the heat ranged from 115° to 130° F. An examination a year later showed that the Mediterranean flour moth was completely eradicated.

Many mill insects do not yield readily to hydrocyanic acid gas, but no mill insect can withstand for any length of time a temperature of from 118° to 122° F. Experiments showed that the leather beetle (*Dermestes vulpinus*, F.) was killed by a temperature of 122° F. without injury to the books it was infesting.

Parrott (P. J.). **New destructive insects in New York.**—*Jl. Econ. Entom.*, vi, no. 1, Feb. 1913, pp. 61-68.

During 1912 the losses sustained by the depredations of insects were very large. In variety of species and extent of damage the record has not been equalled for many years, whilst a number of comparatively new insects came to the front.

The Pear Thrips (*Euthrips pyri*), attacks all of the important tree fruits, but seems to be specially injurious to pears of the varieties Kieffer, Seckel and Clapp Favourite. During the spring of 1912 the blighting of blossom clusters in some orchards was very severe and caused a great reduction in fruit yields. Apple trees, though visited by large numbers of the adults, suffered to a much less extent. The stems of sweet cherries were specially attractive to the adults for the deposition of eggs. Spraying is the most promising means of affording protection to orchards.

The Cherry Sawfly Leaf-miner has done considerable damage. The pest attacks sour cherries, preferring the Morella variety. The larvae eat the interior of the leaf, leaving the epidermis, which turns brown and forms a large conspicuous blister. Often the whole leaf is mined, but usually from one-quarter to one-half is destroyed. The principal damage occurs during the last week of May and the early part of June, or about one month before the harvesting of the fruit. The extent of damage varies with the season and if new growth is not abundant the loss of leaves can hardly fail to affect the yield to an important degree. The sawfly proves to be a new species and is referable to a new genus. It has been described by Dr. A. D. MacGillivray as *Profenusa collaris*.

*Polydrosus impressifrons*, Gyll., has become extremely abundant. These weevils have been observed on the young leaves of poplars and willows, and also on the foliage of roses, apples and pears. During 1912 their destructive capacity was noticed on a large block of grafted willows (*Salix caprea*), serious injury being caused by the beetles feeding on the young buds of the grafts. Little information has been obtained regarding this species, as it has attracted no special attention in Europe. Schilsky says it is quite common in Germany, and Zimmerman says that in Austria the beetles are not numerous enough to be destructive. Giard intimates that it is a common but not an important insect in Europe, but this does not warrant the conclusion that it will prove of no importance in America.

Apple and Cherry Ermine Moths. *Yponomeuta* caterpillars were introduced into the United States in shipments of foreign nursery stock. Special precautions have been taken against them and infested plants have been detected in thirteen localities in New York State. Over nine hundred colonies of caterpillars have been collected; from some of this material two species of moths have been bred *Yponomeuta malinellus*, Zell., which thrives largely on apple, and *Y. padellus*, L., which is a more general feeder, showing preference for hawthorn, plum and cherry. Both species are common and destructive fruit pests in Europe.

The False Tarnished Plant-bug has caused serious losses of pears. [*See* p. 126 of this Review.] It also seeks grape blossoms and punctures the stems as well as the pedicels of the blossoms and fruits, causing imperfect clusters of grapes.

In recent years the work of various Capsids on apple and pear fruits has been increasingly conspicuous. In addition to *Lygus invitus*, the nymphs of *Campylomma verbasci*, Meyer, and *Paracalocoris colon*, Say, have been observed puncturing young pears soon after the dropping of the blossom. The red bugs (*Heterocordylus malinus*, Reut., and *Lygidea mendax*, Reut.) are doing considerable damage by destroying young apples, or causing the fruit to be deformed so that it is unmarketable.

Last in the list of new destructive insects of New York and more important than all is the Gipsy Moth (*Porthetria dispar*, L.). The pest is largely confined to a few old apple trees in the rear of several residences. According to G. G. Atwood, the presence of this species in the residential section of New York appears to be due to importations of nursery stock which was unpacked in the immediate vicinity of the fruit trees; the infestation was probably started by not more than one mass of eggs, and is not more than three years old.

Jones (C. R.). **Maize Pests in the Philippines.**—*Philippine Agric. Review*, part 1, no. 3, March 1913, pp. 115-117, 1 fig.

The larvae of three species of Noctuids have thus far been found injurious to maize in the Philippines. Severe outbreaks are exceptional and only occur in abnormal seasons; more or less damage is however done from year to year by these worms, and in many cases the cornstalks are eaten down to the ground, necessitating replanting. The Visayan Islands were infested throughout in 1912, and the pest may be common in other parts of the Archipelago, although no reports to this effect have been received by the Bureau of Agriculture.

The three species referred to are, *Prodenia litura*, F., and *Sphodoptera mauritia*, Boisd., which eat the leaves, and *Chloridea obsoleta*, Hübn., known as the bud-worm, from the habits of the larva. The extent of damage is exceedingly variable; the leaves may be stripped only here and there or whole fields may be entirely destroyed. Large plants resist better than smaller ones, new leaves being more quickly formed, but this defoliation retards the growth of the stalks, and is thus detrimental to the production of grain.

the best method of control is by the use of arsenical poisons and of these arsenate of lead and Paris green give the best results. They may be applied in either the dry or liquid state. The dry method is more simple, and arsenate of lead is preferable to Paris green, the latter, if applied in excess, having a tendency to burn the plants, whereas they may be covered with the former without fear of injury. Either poison should be mixed with 4 or 5 times its weight of flour or air-slacked lime; this will reduce the cost of application without diminishing the effect. The operator carries two cloth bags at either end of a bamboo, so arranged that as he walks between the rows, each bag hangs over a row; as he reaches a plant he jars the bamboo, and in this way sufficient powder is shaken out. Poisoned bait has also been used with success, the preparation recommended being 50 lb. of rice bran to 1 lb. of Paris green, with the addition of some burnt sugar and water. This mixture is dropped in balls on the ground around the plants. As the caterpillars are general feeders and are found extensively upon grass around the edges of the fields, it is a good plan to apply the poisons to these places, but this grass must not be used as food for animals.

JONES (C. R.). **The Mango Bark Borer.**—*Philippine Agric. Review*, part 1, no. 3, March 1913, pp. 118-124, 3 pls., 1 fig.; Circular No. 20 of the Bureau of Agriculture.

The author's attention was called in October 1912 to a very serious insect attack upon the mangos in the suburbs of Manila, many trees having been killed from this cause. The insect was identified as *Plocaederus ruficornis*, Newm., a comparatively large Cerambycid beetle, and it has subsequently been discovered that the pest is not confined to Manila, but has been reported from Baliuag, Bulacan; Pontevedra, Occidental Negros; San Pablo, Laguna; and Lamao, Bataan.

Although the author does not think it desirable to arouse unnecessary alarm as to this pest, he nevertheless regards it as the most serious menace to the mango industry at present in the Philippines, and precautions should be taken to keep it under control.

Observations near Manila show that the beetle prefers the larger trees and in fact no tree of less than 10 years of age was found to be infested. The trunk and underside of the larger branches are the points usually attacked and it is not until the tree has become severely weakened that the tops of the limbs are invaded. The first attack is frequently made at the base of the trunk, the larvae working their way slowly upwards and each successive brood beginning their attack higher up the trunk or out on the larger branches.

The author says that the deplorable custom of slashing the bark of the mango trunk in order to force the tree into fruit, is in part to blame for the injury, since the older bark curling up slightly at the margin of these "bolo," or cutlass, scars forms a very attractive place for the female to deposit her eggs. Trees

generally recover from the first attack, since the bark is of sufficient thickness to allow the larvae to feed in it without seriously damaging the cambium layer and the young sapwood beneath; when other attacks follow, however, the tree is frequently so weakened that its death results.

Control was first thought to be hopeless, but a careful study of the insect and the behaviour of the tree under treatment indicate that the methods recommended will suffice to check, if not to eradicate the pest. A large number of larvae are required to cause sufficient damage to produce the death of a large and vigorous mango tree, so that the reduction of the number of these beetles below the killing point in any outbreak will render future damage comparatively slight, and concerted action should practically eradicate the pest; but if it is allowed to continue uncontrolled, one of the most important fruit trees of the Archipelago may be practically wiped out.

The life-history of the insect is briefly as follows:—The eggs are deposited singly on the bark of, or inserted into crevices or wounds in, the base and lower part of the trunk. The young larva burrows its way into the inner bark and in the soft tissue between the sapwood and the bark the entire larval stage is passed. As there is no frass the presence of the larva is not easily detected from the outside, but by careful tapping an acute ear will detect the hollow sound which indicates its burrows, some of which may be 40 centimetres long by 20 centimetres wide. The larva, pupa and perfect insect are briefly described and figured. The full grown larva is 5 to 6 centimetres in length and when ready to pupate forms a calcareous cocoon in the frass under the bark. The adult insect is rather a conspicuous beetle 23 to 45 mm. in length, the female being fully twice the size of the male. The Tagalog name for this beetle is "Barbero."

The only feasible method of control is to extract the insects from the trees, and the apparatus required is a ladder, a rope, and a spray pump, and a cutlass or some other tool for removing the bark over the infested areas. The labourer simply cuts or pulls off the bark and removes all the frass, grubs and pupal cases. A triangular-bladed hoe fastened to the end of a bamboo pole may be used with great advantage on the branches and upper part of the trunk. When the burrows have been cleaned out and the frass and decaying bark entirely removed the area should be sprayed with a resin wash to prevent the entrance of fungi and wood-boring insects. Observations made by the author show that trees treated in October and kept under close observation have recovered completely, new bark growing over the exposed areas and some trees which had been practically girdled by the insects recovered, flowered and bore fruit.

The mere exposure of either the larva in its burrow or the pupa after removal from its cell was found to be fatal, and for this reason rearing experiments in the laboratory were rendered exceedingly difficult; but as a few live insects may be left in the material removed by the labourers, the burning of this is strongly recommended.

Jones (C. R.). **The Mango Fruit Fly and other pests in the Philippines.**—*Philippine Agric. Review*, part 1, no. 3, March 1913, pp. 141-142.

The author calls attention to the fact that some months ago fruit of *Eugenia malaccensis*, L. (the Malay Rose Apple) obtained in the market was found to be infested by the Mango Fruit Fly (*Dacus ferrugineus*, F.). These flies are common throughout India, Ceylon, Java and Amboina, as well as the Philippines, and do considerable damage to fruit, particularly to mango and citrus fruits. Over 50 species of the genus *Dacus* have so far been described from Malaysia. In many gardens throughout Manila considerable damage has been done to tomatoes by a Coccinellid, *Epilachna vigintioctopunctata*, F. This pest feeds, in both the adult and larval stages, on the upper and lower epidermis of the leaf. Observations made on two females which emerged on 6th February show that from 6th March to 15th May these two insects laid 960 eggs in 40 clusters. Paris green or arsenate of lead affords sufficient control. Great damage has been done to young maize by the Maize Stalk-Borer (*Pyrausta castalis*, Schultze). This Pyralid bores the stalk at the joints, in which it spends both the larval and pupal stages. The only method of control is by trapping, by destroying infested stalks or by parasites. So far this pest has only been reported from Luzon.

Rust (E. W.). **New Peruvian Parasites from** *Hemichionaspis minor*.—*Entom. News, Philadelphia*, xxiv, no. 4, April 1913, pp. 160-165.

The tree-cotton (*Gossypium peruvianum*) in the Department of Piura, N.W. Peru, is infested by a scale-insect, *Hemichionaspis minor*, the local name for this pest being "piojo blanco." The latter has numerous enemies, especially among the Aphelininae and Signiphorinae. The new species *Prospaltella peruviana* is a very common parasite of *H. minor*, and *Signophora lutea*, sp. n., was also found on *Pseudaonidia* infesting cotton and citrus. *Neosignophora nigra* (gen. n., sp. n.) has been reared by Prof. C. H. T. Townsend from *H. minor* on cotton from Chaquira.

Hardy (J. R.). **Notes on** *Melanotus castanipes*, **Payk.**—*Lancs. Naturalist*, v, no. 59 (N.S. no. 47), Feb. 1913, pp. 415-416.

In Delamere Forest, Cheshire, in December 1912, the author captured a female of the Elaterid beetle, *Melanotus castaneipes*, at the end of a burrow of *Rhagium bifasciatum* larvae, infesting a log of *Pinus sylvestris*. Several specimens of *Ichneumon confusorius* and *I. albiger* were also found in the burrows of the Longicorn, probably using them as a hybernaculum.

GREEN (E. Ernest). **Further observations on the genus** *Margarodes*. *Records of the Indian Museum*, ix, pt. 1, Feb. 1913, pp. 1-9, 4 pls.

*Margarodes papillosus*, Green. It is probable that the males pass through a nymphal encysted stage similar to that of the females, though they are at present unidentified. Specimens were obtained from Honnali, Shimoga District, Mysore, and from the Bellary District. In the former locality they were found while digging for egg-pods of the Tola Grasshopper in a broad "bund." They were fairly numerous and were obtained from 5 to 7 inches beneath the soil, being associated with "hariali" grass (*Cynodon dactylon*). This form was found on all soils, black and red, but seems to be more abundant in clayey soils. The adult males and females emerged early in June.

*Margarodes niger*, *Green*. The male is unknown; the nymphs undergo several stages, their exact number is uncertain, but the final stage is in the form of a globular cyst of an opaque black colour. The specimens of *M. niger* were obtained from the same localities as *M. papillosus*. In both instances they were found at the roots of *Cynodon dactylon* and the early stages of the insect were found to be actually attached to the rhizomes of this grass. They were also found at the roots of red gram. The peculiar globular egg-like bodies were met with at a depth varying from ½ to 3 inches in the soil, mostly in red soils. Towards the end of February and in March some of these bodies hatched into stout, soft, hairy, grub-like creatures, which were the adult females.

HOLMAN HUNT (C. B.). **Note on Insect Pests.**—*Agric. Bull. Fed. Malay States*, i, no. 8, March 1913, pp. 294-295.

An undetermined butterfly larva is very prevalent in the coconut plantations of Perak, being found near Kuala Kangsar and Parit Buntar. The caterpillars are 2 or more inches in length, of a greenish colour, with a purple band running along the sides and crossing the hind end of the abdomen. They spin the sides of one blade of a coconut leaf together, forming a tube, in which one or more may live and from which they emerge to strip the blades in the neighbourhood of the mid-rib. The larva is full fed in March, and is liable to fungus and Ichneumon parasites. A suggested means of dealing with the pest is to collect and keep the larvae in order to breed and release any parasites they may contain, while the butterflies that emerge could be destroyed.

A somewhat similar pest is attacking plantains in various districts. In this case the larvae roll up pieces of the plantain leaf like a huge cigar. Similar treatment is advised for the eradication of this pest.

In Krian a Psychid moth is causing much damage to coconut leaves; while a Hispid beetle is also damaging the coconuts in Singapore. The beetle is difficult to eradicate: it lies in the axils

of the leaves and in both stages eats holes in the leaves. Collecting affected leaves and burning them would be the best preventive. *Brachartona catoxantha* has done considerable damage near Batu Gajah, but the native owners of holdings refused to allow steps to be taken to check the pest.

ALLEN (W. J.). **Prune Growing.**—*Agric. Gaz. of N.S. Wales*, xxiv, pt. 3, March 1913, pp. 245-255.

The following instructions are given for dealing with the insect pests of prunes. For San José Scale, red oil, lime and sulphur, and fumigation are recommended. Spraying should be as late as possible before the buds burst in the spring. For Curculio, the trees should be sprayed with arsenate of lead just as the buds are opening and again when the petals have fallen. The fact that the beetles feed upon the foliage of blooming trees just about the time when the fruit is forming, makes the spraying method effective. Up to the present the pest has not been troublesome. Trees should be carefully watched for the castings of borers. Regularly remove and burn or boil any infected and fallen fruit, to eradicate fruit fly. For red mites use lime and sulphur and red oil as late as possible before the buds burst in the spring. For aphis, spray as soon as observed and as often as necessary; tobacco wash, Sunlight soap and red oil emulsion are advised.

KLEINE (R.). **Die Kümmelmotte.** *Schistodepressaria nervosa*, **Hw. Ein Beitrag zu ihrer Biologie und ihrer Bedeutung für die Landwirtschaft.** [The Caraway Moth. *Schistodepressaria nervosa*. A contribution to its biology and agricultural significance.] —*Zeits. Wiss. Insektenbiol.*, ix, 2, 15th Feb. 1913, pp. 37-41; ix, 3, 15th March 1913, pp. 69-72, figs. 1-7.

Comparatively few insect pests cause any serious harm to the caraway plant. The moth, *Schistodepressaria nervosa*, however, is responsible for immense devastations, so that a knowledge of its life-history is of great importance. It is not easy to detect, partly on account of its coloration, and partly owing to its habit of hiding in dark places.

As a result of his observations the author concludes that *S. nervosa* pairs in autumn, the males dying soon after, while the females hibernate until the following March. The date of oviposition (usually March till May) depends on the temperature, so that both pupae and females that have not yet oviposited may be found at the same time. The supposition that the females oviposited on leaves led to the practice of letting sheep graze off the outer leaves or stems. This has been tried on a large scale, but without success. The reason is elucidated by the author's observations, which showed that the eggs are never laid on the leaf, and only occasionally on the distal end of the leaf stalk, but generally in the convex inner part of the latter near the axis, being usually found in pairs, and rarely in threes or singly.

DAVIDSON (J.). **The Structure and Biology of *Schizoneura lanigera*, Hausmann, or Woolly Aphis of the Apple Tree. Pt. i.**—*Quarterly Jl. Microscopical Science*, lviii, pt. 4, 1913, pp. 653-701, pl. 38-42, text-figs. A-D.

The author, after reviewing the present state of knowledge regarding the infection of the apple trees by aphids and the life-history of *S. lanigera*, describes the structure of the apterous viviparous female. This description forms the first part of the paper to which is added a fairly extensive bibliography. The damage to the infected trees is caused by the galls (which may possibly be formed by a special ferment occurring in the salivary glands of gall-producing species) hardening and cracking and so allowing the entrance of spores of *Nectria ditissima*, the canker fungus. The 'mother queen' of *S. lanigera*, differing from the apterous viviparous female in being stouter and of a shorter contour, lives in the crevices of the bark of apple trees and produces a colony of 'lice.' These become imbedded in their waxy secretion, moult, and in two or three weeks become apterous viviparous females. Towards the end of summer some of them develop into nymphs, which in their turn develop into winged viviparous females. The latter seek other apple trees and produce new colonies of lice. Late in the autumn sexual males and females may be produced, but this is rare. The oviparous female of this true sex generation lays a single egg and dies. The winter eggs remain in the cracks of the bark during the winter and hatch out in the following spring, and the resulting larvae develop into mother queens.

TOWER (D. G.). **A New Hymenopterous Parasite on *Aspidiotus perniciosus*, Comst.**—*Ann. Entom. Soc. America*, vi, no. 1, March 1913, pp. 125-126.

The parasites were reared during October 1912 from *Aspidiotus perniciosus* at Amherst, Mass., specimens being sent to Dr. L. O. Howard, who regarded them as a new species, *Prospaltella perniciosi*.

MANEE (A. H.). **Observations on Buprestidae at Southern Pines, North Carolina.**—*Entom. News, Philadelphia*, xxiv, no. 4, April 1913, pp. 167-171.

Occasional specimens of *Chalcophora virginiensis* were found on young pines in October. During the first quarter of the year they live under pine straw, mostly on the north side of old trees, while they were common, together with eggs, on freshly dead pines in April and May. *C. georgiana* is more abundant than the last species and feeds on young pine needles.

*Dicerca punctulata* was found under pine straw or in the bark of loblolly and long leaf pines. *Buprestis apricans* oviposits exclusively in cracks of dry dead spots or blazes of large *living* long leaf

...ides. A new species, *Melanophila carolina*, Blanchard MS., was discovered on needles of young long leaf pines. Other species destructive to pines are *Anthaxia flavimana*, *Chrysobothris ... ola*, *C. dentipes* and *C. pusilla*. Of the oak Buprestids, *Brachys ovata* is the most abundant, living and pupating on the leaf; others are *B. aerosa*, *Anthaxia quercata* and *Taphrocerus gracilis*. On persimmon were found *Dicerca obscura*, and *Chrysobothris chrysoela*; on the black alder, *Dicerca pugionata*, *Eupristocerus cogitans* and *Agrilus granulatus*; on willow, *A. politus*; and on blackberry, *A. ruficollis* and *Acmaeodera culta*.

Sest (S.). **Contro l'afide lanigero del melo.** [Control of the Woolly Apple Aphis.]—*Rivista di Agricoltura, Parma*, xix, no. 15, 11th April 1913, pp. 231-232.

The author quotes Professor Tamaro in advising methods for combating this pest:—(*a*) to clean carefully with a brush and wash the grafts and all apple plants of doubtful origin with Nesler's insecticide before the final planting; (*b*) to inspect the orchards in winter and early in spring and wash all infected points with the same insecticide and to plug all holes in the grafts with liquid wax, thus depriving the insects of air and killing them; (*c*) to lay bare the roots and examine them thoroughly and destroy all colonies found. Whenever plants are found to be infected examine them continually and carry out the cleaning processes with care and without remission, because mechanical cleaning is of more value than either the quality or the quantity of the insecticide. The formula for Nesler's insecticide is as follows:—Soft soap 40 parts, amyl alcohol 50 parts, extract of tobacco 25 parts, spirit 200 parts, and water 1,000 parts. The great advantage of this mixture is that it penetrates the waxy coating of the insects.

**Black Currant Mite in Ireland.**—*12th Ann. Gen. Rept. Dept. Agric. Ireland*, 1913, p. 87.

Seventy-seven cases of Black Currant Mite were reported in Ireland during the year ending 30th September 1912, and the usual notices requiring the destruction of affected bushes were served on the persons concerned.

Girault (A. A.). **A Few Fragments on** *Anasa tristis*, **De Geer (Hemipt.).**—*Entom. News, Philadelphia*, xxiv, no. 2, Feb. 1913, p. 56.

At Paris, Texas, a male of the Tachinid, *Trichopoda pennipes*, was reared from an adult female *Anasa* (Squash Bug) which was found to have an empty abdomen. The maggot of the parasite made no visible exit through the body of its host.

GIRAULT (A. A.). **Notes on *Hadronotus carinatifrons*, Ashmead (Hymen.).**—*Entom. News, Philadelphia*, xxiv, no. 2, Feb. 1913, p. 57.

A mass of eggs of *Anasa tristis* (Squash Bug), at Paris, Texas, in June 1904, was observed to be parasitised by *Hadronotus carinatifrons*.

[This Chalcid was originally described from St. Vincent.—Ed.]

BRETHES (J.). **Descripción de un nuevo genero y especie de cochinilla de la Republica Argentina.** [Description of a new genus and species of Coccid from the Argentine Republic.]—*An. Mus. Nac. Hist. Nat., Buenos Aires*, xxiii (1912), 1913, pp. 279-281, 1 fig.

A new Coccid, named *Colobopyga magnani*, was discovered on the mid-rib on the under side of the leaf of the palm, *Chamaerops humilis*, at Buenos Aires.

GALLARDO (A.). **La destrucción de la langosta por sus enemigos naturales.** [The destruction of the locust by its natural enemies.] *An. Mus. Nac. Hist. Nat., Buenos Aires*, xxiii (1912), 1913, pp. 155-165.

The wholesale destruction of the migratory locust, *Schistocerca pallens*, in Yucatan, by means of the *Cocobacillus acridiorum*, discovered by F. d'Hérelle, seemed so successful, that after negotiating with the proper authorities, M. d'Hérelle was invited to introduce the parasite into Argentina.

After increasing the virulence of the cultures by inoculating locusts in succession and then isolating the contents of the intestine of the 12th series in bouillon, he commenced his experiments in the beginning of January 1912. A handful of alfalfa sprinkled with 20 ccm. of this culture was placed in a cage containing 250 to 300 locusts, with the result that after 48 hours one-half of the insects had died, and after five days all had been destroyed. The contents of the intestine were practically pure cultures of the *Cocobacillus*.

A second experiment showed that one drop of the culture was sufficient to kill four locusts immediately, 30 per cent. after 48 hours, 80 per cent. after three days, and the last locust died on the fifth day. These and other experiments led to experiments on a large scale instituted by the inspectors of the Defensa Agricola Commission in various parts of the Santa Fe Province. On the 16th January 1912, at Escalada, a swarm of locusts half an hectare in extent was sprayed with one litre of the culture liquid, applied with the Vermorel apparatus. A week later, only two per cent. survived and these eventually died on 24th January.

Two pieces of land at Matilde, each about 2 hectares in extent and infested with flying locusts, were sprayed with three litres of the *Cocobacillus* culture, resulting in a heavy mortality during the first 24 hours, and the blades of grass were dotted with the excreta of the infected specimens. After three days no living locusts were to be found.

The disease spreads with great rapidity and dead locusts infected with it were discovered fifty kilometres from the centre of distribution only a few days after the first infection. Further large-scale experiments carried on by the author in the wooded province of La Rioja proved without doubt that *Cocobacillus acridiorum* affords the most efficacious means of destroying the pest. He concludes by an appeal to the Argentine Government to show its appreciation of the immense services rendered by the National Museum of Natural History in a practical manner by a generous endowment of entomological and other scientific research.

**Lime Twig Borer.**—*Agric. News, Barbados*, xi. no. 284, 15th March 1913, pp. 90-91.

Towards the end of 1912 the limes in a certain district of Antigua were found to be suffering from the attack of a new pest. The branches were broken down and hanging in a dry and withered condition and a few had broken off and were lying on the ground. On examination it was found that at the point of breaking each of these branches had been neatly cut nearly all round, so that as the wood dried a very slight gust of wind was sufficient to cause it to break at the point of injury. The cause of the damage has been found to be a small Longicorn identified by the Imperial Bureau of Entomology as *Elaphidion mite*, Newm. Specimens are in the British Museum collection from St. Thomas, St. Bartholomew, St. Kitts and Guadeloupe, and it now appears that it is fairly distributed throughout the Leeward Islands. The remedy suggested is to cut off and collect all twigs and branches so attacked and burn them. Other insects which destroy the branches of trees in a similar manner are *Elaphidion villosum*, which attacks the oak in the United States and also apple-trees; but in this case, the larva after girdling the branch returns to the outer portion and falls to the ground with it. In the case of another twig girdler of the West Indies, *Oncideres amputator*, the girdling of the twig is accomplished by the parent female, the egg being laid in such a way that it will fall to the ground with the twig which is to provide food for the larva. The lime tree bark borer, *Leptostylus praemorsus*, attacks patches of dead bark on the main stem of the tree such as are often occasioned by tillage implements or bad pruning. They feed on the junction of the dead and living tissue and if the attack be sufficiently severe the entire tree may be killed from a point near the level of the ground.

WINTER (W. R.). **The Fruit Fly.**—*Dept. of Agric., Bermuda*, 19th Feb. 1913, 14 pp.

In this pamphlet, which is issued by the Department of Agriculture for the benefit of fruit-growers in Bermuda, a brief statement of the life-history of *Ceratitis capitata* is given and a list of 45 fruit trees which are known to be attacked by the fly, to which grapes and mulberries must occasionally be added. Some years ago it was attempted to control the fly by hanging saucers of kerosene oil in the trees, but this was found useless, and the most efficient control in Bermuda has been found to lie in the destruction of the broods by the careful and thorough removal of all affected fruit. This should be destroyed as soon as gathered by being either burnt or boiled; or sunk in the sea in a weighted sack; on no account should it be thrown into ashbins or pits, buried, or left on the ground. The ground under all fruit trees must be kept clear of all growth, fallen leaves or fruit and other rubbish, and the surface should be loosened from time to time with a rake to a depth of two or three inches to enable the birds to get at any larvae or pupae that may be in the soil. This is stated to be a most important method of control. Spraying leaves of the fruit trees and surrounding foliage with a poisoned bait has been most successful in Italy and the Cape of Good Hope. The author gives the following mixture as having been found of practical utility in Bermuda: Lead arsenate 1 oz., treacle or molasses 2 qts., water 1 gal. The addition of 2 or 3 tablespoonfuls of glycerine prevents the mixture from drying too readily. An abol syringe is recommended as the best for use. The fruit should be washed before being used as food.

The South African granadilla (*Passiflora edulis*), which fruits after the loquat and before the peach in Bermuda, forms an excellent trap fruit when grown on scaffolds or fences near the fruit trees; the *Ceratitis* oviposits freely in this fruit, but the eggs become encysted in the rind and never hatch. Experiments made in the autumn of 1912 at the Bermuda Agricultural Station with fruit and imitation fruit coated with tanglefoot, proved most successful, especially after the bulk of the sweet oranges had been gathered. Imitation fruit can be made by painting old tennis or other balls, eggs which have been blown, small gourds, etc., with yellow paint or enamel, and these are more satisfactory than fruit as they do not rot. When the tanglefoot becomes hardened with dust, etc., it can be washed off with methylated spirits and a fresh coat applied. The following instructions for preparing tanglefoot are given:—Castor oil 1 part by weight, powdered resin 2¼ parts by weight; dissolve the resin in the castor oil and heat and stir well during the process. It has not been found necessary to add any odorous material, such as oil of lemon, to the mixture. This form of control is most effective when the trees are in fruit and in blossom, and when the fruit is small and green. The fruit fly has been declared by the Bermuda Board of Agriculture to be an insect pest within the meaning of the Fruit Protection Act, the clauses of which affecting fruit-growers are given at length.

TOWNSEND (C. H. T.). **On the History of Cottons and Cotton Weevils.**—*Science*, xxxvii, 25th April 1913, pp. 638-639.

Referring to his article on the Peruvian square-weevil in the Jl. of Economic Entomology for April 1911, the author believes that he has now collected sufficient palaeontological evidence for the deduction that "*Anthonomus vestitus* has probably attacked cotton in humid north-western South America for upwards of a million years, if not longer. It is therefore extremely probable that this species is not confined to Peru and Ecuador." One of the periodic separations between N. and S. America explains the fact that *A. vestitus* does not occur in N. America, and that *A. grandis* was not dispersed as far as S. America. Both the weevils have originally developed on cotton, having no other food-plant.

**Root Borers and other Grubs in West Indian Soils.**—*Agric. News, Barbados*, xii, no. 286, 12th April 1913, p. 122.

A root borer of sugar-cane, *Exophthalmus esuriens*, occurs in Antigua. In St. Kitts a weevil grub has been found attacking mature canes in a manner exactly similar to that in which the larvae of *Diaprepes abbreviatus* attack the same plant in Barbados. This latter insect is not known either in St. Kitts or Antigua, but the adults of *E. esuriens* are very common among the leaves of pigeon peas, castor and French silk cotton. The relationship between this weevil and the root-boring larva of the cane in the Leeward Islands has not been proved, but the evidence so far available strongly indicates that they are referable to the same species. The eggs are laid in the same manner and greatly resemble those of *Diaprepes*, but the eggs of *Exophthalmus* have not been observed on the leaves of the sugar-cane. *E. esuriens* is found in St. Kitts, Nevis, Antigua, Montserrat and Dominica. The extent of injury up to the present to sugar-cane in Antigua and St. Kitts is not known, but is possibly greater than is suspected and it is probable that when the planters learn to recognise this form of injury it will be found in many instances to account for what has in the past often been attributed to the effects of drought and the ravages of fungus disease. The insect now known as *E. esuriens* was formerly referred to in the publications of the Imperial Department of Agriculture as *Epicaerus aeradus*, especially in Montserrat where it is abundant, and where it is often found feeding on the leaves of limes. The methods of control would be the same as those suggested for *Diaprepes abbreviatus* in Barbados. [*See* this *Review*, p. 98.] A large weevil, the Fiddler Beetle (*Praepodes vittatus*), attacks the orange trees in Jamaica, often girdling them and causing their death. It is said to be parasitised by a large black wasp, *Elis atrata*, of the family SCOLIIDAE. The Golden or Orange Leaf Weevil (*Diaprepes spengleri*) is apparently only known in St. Vincent and Porto Rico. The larvae and their food habits are unknown in St. Vincent, but in Porto Rico they attack the roots of the orange, guava, avocado, mango and rose. The adult

insects feed on the leaves of limes and other citrus trees, pigeon peas, castor and several cruciferous plants. In Porto Rico young, newly planted out orange trees have been seriously damaged by this insect and spraying with arsenate of lead has been found necessary.

**Outbreak of Forest Tent Caterpillar.**—*Ottawa Naturalist*, xxvii, no. 1, April 1913, p. 10.

In 1912 an important outbreak of the Forest Tent Caterpillar, *Malacosoma disstria*, occurred in the Gatineau Valley, north of Ironsides. Miles of forest were devastated, the foliage of poplar and birch in particular being entirely eaten, and for a certain period trains were unable to take the grade between Ironsides and Chelsea, owing to the thousands of caterpillars on the rails.

PICARD (F.). **Sur la parthénogenèse et le déterminisme de la ponte chez la Teigne des Pommes-de-terre** (*Phthorimaea operculella*, Z.). [On the parthenogenesis and oviposition of the Potato Moth (*Phthorimaea operculella*).]—*C.R. Acad. Sci., Paris*, clvi, no. 14, 1913, pp. 1097-1099.

The females of *Phthorimaea* begin to oviposit from 24 to 48 hours after copulation, 40 to 80 eggs being laid in the course of one, two or three days. The unfertilised females live much longer than the fertilised ones and sometimes lay not more than 40 eggs. Only in nine out of more than a hundred cases has the author been able to record the occurrence of parthenogenesis. The parthenogenetic larvae that were hatched developed more slowly and irregularly than the others. Altogether 23 ♀ and 21 ♂ were produced parthenogenetically in the course of the author's experiments. The results coincide with Weijenberg's observations on *Lymantria dispar*, in which species one fertilised female lays 60 times as many eggs as the parthenogenetic females. The potato moth oviposits on a great number of Solanaceous plants, but only on rugose surfaces, in cracks and depressions. The smooth-leaved flax allied to the Solanaceae is immune, whereas the unrelated but rough-leaved Cynoglossus is visited by the moth.

The caterpillar of *Phthorimaea* will starve on a tomato, but will eat boiled potato with avidity, to its own undoing. Oviposition may be stimulated by contact of the end of the abdomen with a rough surface, *e.g.*, muslin.

PICARD (F.) & BLANC (G. R.). **Sur une septicémie bacillaire des chenilles d' *Arctia caja*, L.** [On a bacterial septicaemia of the caterpillars of *Arctia caja*, L.]—*C.R. Acad. Sci., Paris*, clvi, no. 17, 1913, pp. 1334-1336.

The caterpillars of *Arctia caja*, which were extremely abundant in the vineyards in the south of France this year, have been practically entirely destroyed by two diseases. One is caused by the well-known fungus, *Empusa aulicae*, the other by a new

*Cocobacillus* (*C. cajae*), apparently allied to *C. acridiorum*, discovered on Mexican locusts by d'Hérelle. The caterpillars become weak and emit a nauseating odour; their alimentary tract only contains a clear liquid frequently devoid of any micro-organism, while the blood contains the *Cocobacillus*, of which the authors were able to make artificial cultures in bouillon. Whether introduced by injection or ingestion the virus was sufficient to kill the caterpillars in twelve hours at 25° C. At a lower temperature (15° C.) the caterpillars died about three days after infection. Caterpillars of *Porthesia chrysorrhoea* are killed in from 24 to 48 hours, while various Coleoptera (*Hydrophilus*, *Dytiscus*, *Cybister*) and Hemiptera (*Notonecta*, *Nepa*, *Ranatra*) are immune against *C. cajae*. The white rat is immune, while the frog (*Hyla arborea*) dies of septicaemia in about two days, its blood containing numerous *Cocobacilli*, injections of which are fatal to *Arctia caja* caterpillars.

VAYSSIÈRE (P.). **La Cochenille du pommier.** [The scale-insect of the apple-tree.]—*Revue de Phytopathologie*, i, no. 1, 20th April 1913, pp. 10-11.

*Mytilaspis pomorum* is widely distributed, having been recorded from Europe, N. and S. Africa, Canada, U.S.A., Brazil, Hawaii, Japan, New Zealand and Australia. In France the Coccid does considerable damage to pear-trees, apple-trees, willows, poplars, etc. In S. Tunisia *M. flava* attacks olive-trees, and in Greece *M. ceratoniae* destroys the carob-tree. Towards the end of August or beginning of September the female lays 40 to 100 white eggs which remain under the scale throughout the winter. During the middle of May the small white larvae spread over the trunk and branches of the tree. After six weeks the male shield is formed, and adult Coccids are common in middle of July. In spite of being destroyed in large numbers by the little Chalcidid (*Aphelinus*), by Coccinellids and by the Blue and Long-tailed Tits, artificial insecticides must be resorted to in France to check the scale. The author recommends insecticides containing paraffin oil and soft soap, *e.g.*, in the proportion of 10 parts of the former to 1 of the latter with 15 of water.

ESSIG (E. O.). ***Scutellista cyanea*, Motsch., bred from *Phenacoccus artemisiae*, Ehrh.**—*Journal of Entomology & Zoology, Claremont, Cal.*, v, no. 1, March 1913, p. 55.

Among some specimens of *Phenacoccus artemisiae*, Ehrh., collected in Ventura County, California, one was seen to be parasitised. From it an adult *Scutellista cyanea*, Motsch., was bred. The author believes that this parasite has not previously been bred from a Coccid of this type. It is interesting to note that the specimens were collected far up in the mountains, which shows that *S. cyanea* is quite common throughout all parts of Southern California. It has been bred from black scale in the mountains in other parts of Ventura County.

WHITNEY (B. B.). **A new Californian Coccid infesting Manzanita.**—*Journal of Entomology & Zoology, Claremont, Cal.*, v, no. 1, March 1913, pp. 50-52.

This new Coccid (*Aulacaspis manzanitae*, sp. n.) has been collected at various points in California and is invariably found on species of Manzanita at an elevation of 1,622 to 4,700 feet above sea-level.

CLEMENT (F. M.). **Strawberry Culture and the Red Raspberry.**—*Ontario Dep. Agric. Fruit Branch*, Bull. 210, March 1913, 28 pp.

The author gives as insects specially injurious to strawberries, "white grubs" and the "strawberry leaf roller." The former is the larva of the June Beetle and lives and feeds in the ground for at least two years. If the soil be ploughed and cultivated yearly, or not allowed to remain in grass or sod for more than one year, the larvae cannot mature, as such cultivation destroys them. Growing strawberries two years in succession encourages them. Before putting land down to strawberries it is well to crop it first with corn, potatoes or roots.

The strawberry leaf roller has not proved serious, except in one case. The remedy is to spray with 3 lb. of lead arsenate in 40 gals. of water as soon as the larvae are noticed to be at work. This should be repeated at intervals, but not when the plants are in bloom or after the fruit is set.

Amongst the insect enemies of raspberries is the snowy tree cricket, which lays its eggs in the canes. It may be kept under control by cutting out and destroying the old canes in winter or early spring, but it is more or less a beneficial insect in that it feeds upon plant lice.

The raspberry cane borer makes two girdles around the cane about half an inch apart, between which the eggs are laid. The egg hatches and the larva bores down in the pith of the cane, causing the upper portion to die. The only remedy is to examine the canes and cut off the affected parts, well below the girdle.

The root borer, the larva of a clear-winged moth, appears in the root of the cane just at the surface of the ground. The largest amount of damage is done in old plantations. The only method of control is to dig out and destroy all attacked and sickly plants.

The larva of the raspberry sawfly does considerable damage by eating the tender green portions of the leaves. It can be controlled by spraying the plants with 2 lb. of lead arsenate in 40 gals. of water. If the fruit be ripe or ripening the larvae may be jarred off by hand on to the hot dust between the rows. Spraying should not be used on ripe or ripening fruit because of discoloration. White hellebore, either dusted over the plants or an infusion of it made by steeping one ounce in 2 gals. of water used as a spray, is recommended as a very good remedy.

COTTE (J.). **Un oiseau cécidophage: la mésange bleue.** [The blue tit, a gall-eating bird.]—*La Feuille des jeunes naturalistes, Paris*, no. 506, Feb. 1913, pp. 21-24.

The insect population of a cork-oak was rapidly decimated by blue-tits (*Parus coeruleus*), the stomachs of the latter containing larvae of the gall-forming *Neuroterus lanuginosus*, *N. saliens* and *Arnoldia cerris*. Other gall-eating birds are, pheasants which devour the galls of *N. quercusbaccarum* and *N. numismalis*; finches destroy the larvae of the former, while the bullfinch eats those of *Perrisia laricis*. *Diplolepsis quercus-folii*, *Cynips lignicola*, *C. kollari*, *Trigonaspis megaptera*, *Rhodites rosae* and *Andricus testaceipes* are likewise preyed on by birds.

GIBSON (A.). **The Cotton Moth**, *Alabama argillacea*, **Hbn.**—*Canadian Entomologist*, xlv, no. 4, April 1913, p. 100.

The author notes the appearance of this moth in very large numbers during the past autumn in Western Ontario. It appeared suddenly, either late in the evening of October 10th, or early in the morning of October 11th. A figure from a photograph is given showing the characteristic habit of the moth of resting with its head downwards. The note is interesting as confirming the northward advance of this species.

JOANNIS (J. de). **Remarque sur un cas collectif de mimétisme chez des lépidoptères.** [Mimicry among Lepidoptera.]—*Bull. Soc. Entom. de France*, 1913, no. 5, p. 137-139.

The author has compiled a list of Lepidoptera destructive to monocotyledons cultivated in India and Java, and was struck by the fact that all these insects by coloration as well as by longitudinal markings were rendered very inconspicuous on their food-plants.

NOCTUIDAE.—*Cirphis loreyi*, Dup., India, Java—rice, maize, sugar-cane; *C. fragilis*, Butl., India—wheat; *C. unipuncta*, Haw., India, Java—rice, oats, sorghum, sugar-cane; *Sesamia inferens*, Wlk., India, Java—maize, sugar-cane; *S. uniformis*, Dudg., India—sugar-cane, rice, sorghum, maize, wheat.

LYMANTRIIDAE.—*Laelia suffusa*, Wlk., Java—sugar-cane; *L. exclara*, Moore, Java—sugar-cane; *Aroa socrus*, Hb., Java—sugar-cane; *Dasychira securis*, Hb., India, Java—rice, sugar-cane, Gramineae.

SPHINGIDAE.—*Leucophlebia lineata*, Westw., Java—sugar-cane.

EUPTEROTIDAE.—*Dreata petola*, Moore, Java—maize, sugar-cane, graminaceae.

NOTODONTIDAE.—*Anticyra combusta*, Wlk., Java—rice, sugar-cane.

PSYCHIDAE.—*Mahasena graminivora*, Hmp., India—cereals.

PYRALIDAE.—*Polyocha saccharella*, Dudg., India—sugar-cane; *Ancrastia ablutella*, Z., India—sugar-cane; *Schoenobius bipunctiferus*, Wlk., Java—rice; *Scirpophaga excerptalis*, Wlk., India—

sugar-cane; *S. auriflua*, Z., India, Java—sugar-cane; *S. mono-stigma*, Z., India, Java—sugar-cane; *Diatraea venosata*, Wlk., Java—sugar-cane; *Chilo simplex*, Butl., India—maize, sorghum, sugar-cane; *C. auricilia*, Dudg., India—rice, sugar-cane; *C. infus-catellus*, Snell., Java—sugar-cane; *Ancylolomia chrysographella*, Koll., India—rice, Gramineae; *Nymphula fluctuosalis*, Z., India—rice; *N. depunctalis*, Gn., India, Java—rice; *Cnaphalo-crocis medinalis*, Gn., India, Java—rice; *Marasmia trapezalis*, Gn., India, Java—maize, sorghum, sugar-cane; *Pyrausta cochle-alis*, Wlk., India, Java—bamboo, sugar-cane.

JONES (C. R.). **The Cigarette Beetle** (*Lasioderma serricorne*, **Fabr.**) **in the Philippine Islands.**—*Philippine Jl. of Science*, viii, D, i, Feb. 1913, pp. 1-42, 9 plates.

The decrease in the exportation of tobacco and its products from the Philippines to the United States from 4,023,404 pesos in 1910 to 1,483,544 pesos in 1911 is undoubtedly to a large extent due to *Lasioderma serricorne*, F. The annual loss of cigars in Manila amounts to about 6,000-13,000 pesos ($3,000-6,500) per factory. A knowledge of the habits of this pest is, therefore, of great economic importance. The beetle occurs in all the principal tropical and sub-tropical tobacco-producing districts, and in Cuba and the Philippines is abundant at any season of the year.

It has been found breeding in raisins, rhubarb, cayenne pepper, rice, ginger, dried fish, upholstery, ergot, turmeric, books, cane-work, gun-wads, liquorice, belladonna, saffron, in pyrethrum powder strong enough to kill cockroaches, and in 1895 did great damage to herbarium specimens in Washington. The chief damage, however, is done by the small holes it eats through the wrappers of cigars and cigarettes. The whitish, tough-shelled egg is deposited singly in crevices of leaf tobacco, most frequently along the midrib, or within the open tip of the cigar or cigarette, and is most difficult to detect.

The incubation period varies considerably in the Philippines, the average being six days. It has been shown experimentally that only 5 per cent. fail to hatch. The size of the beetle depends on the quality as well as on the quantity of food obtained by the larva; in every case beetles obtained from selected cigars were double the size of those from bales of low-grade tobacco. Also the infestation first appears in the *claro* cigars and Turkish cigarettes, while cheap-grade tobacco and *maduro* cigars often remain in the factories from one to two years without becoming infested. Eggs, larvae, pupae and adults are found in tobacco factories and warehouses throughout the year, but the greatest abundance of adults seems to occur in March and April. The adults themselves appear to do no damage.

A Clerid has been observed which is predaceous on the larvae and pupae of *L. serricorne* and six adult Clerids devoured 31 in a single night. A Chalcidid of the genus *Norbanus* lays a single egg in the pupa of the beetle. A far less effective parasite is a small white mite of the genus *Rhagidia* which attacks the beetle in all stages except the adult.

Many points have to be considered in combating the cigarette beetle. All the tobacco becomes infested in the piles or *mandalas* in which fermentation takes place in the curing process, and as the development of the beetle is continuous throughout the year, the manufactured tobacco is largely infested with eggs. It is important that the agencies used to destroy the cigarette beetle should not alter the aroma and other characteristics of the tobacco. In Manila, hydrocyanic acid gas and carbon bisulphide are commonly used for fumigation, as, provided the necessary precautions are taken, no appreciable deterioration in the quality of the cigar and, according to laboratory experiments, no injurious effects on the consumer are noticeable. Habitual smokers were unable to notice a difference between treated and untreated tobacco. A room in the factory is set aside for fumigating and the tobacco is treated there in the leaf. The cigars are afterwards guarded in this room against reinfestation. Work-rooms in which the drying, selecting, boxing and labelling of cigars takes place may be absolutely protected, once all the stages of the beetle have been eliminated, by covering doors and windows with wire screens, not coarser than 10 meshes to one centimetre. All manufactured products should be kept in tin-lined boxes, instead of being piled on the floor. The cost of treating leaf-tobacco in fumigation-compartments in Manila is 2·06 pesos (4s. 3*d.*) for 1,400 kilograms (3,080 lb.) with hydrocyanic acid gas and 15 centavos ($3\frac{3}{4}$*d.*) per thousand cigars with carbon bisulphide. Tables showing the volumes of the gas required and their effect on eggs, larvae and adults are given.

Where cigar and cigarette factories are equipped with boilers and machinery, subjecting tobacco to steam is a useful way of annihilating the *Lasioderma*. It has been found that moist heat between 60° and 90° is sufficient to kill the insect in all its stages within half an hour. Care must be taken to avoid excessive moisture and mould, and to place high grade wrapper leaves in the centre of the steaming drum, as they are liable to become somewhat dark and brittle. Where a cold storage plant is available, it is found that at a temperature of 8° C. the beetle in all its stages can be killed in four days. At a temperature of between 8° and 14° C. the vitality of the larva, pupa and adult is seriously impaired. After stating the cost of all these remedial measures the author discusses the relative merits of a light and petroleum trap and a trap consisting of tobacco 'manos,' much in the favour of the latter. The results of analyses showing the yield of hydrocyanic acid from cigars treated with the gas to be negligible, and some excellent photographs illustrating the ravages of the beetle conclude the paper.

VUILLET (A.). **Acclimatation du *Novius cardinalis* dans le Midi de la France.** [Acclimatisation of *Novius cardinalis* in the South of France.]—*Revue de Phytopathologie*, i, no. 1, 20th April 1913, pp. 8-10.

In 1910 *Icerya purchasi*, a native of Australia, which in 1880 threatened to annihilate the orange and citrus ranches in California, and has since appeared in Florida, S. Africa, Egypt,

Hawaii, Portugal and Italy, was imported from the latter country to the South of France. It speedily spread in the beautiful gardens on Cap Ferrat (Alpes-Maritimes), until it was found necessary to check its progress by the same method which made the *Icerya* practically harmless in the countries mentioned, namely, by the introduction of the Coccinellid, *Novius cardinalis*. As only seven specimens of the latter insect, sent from the Station of Economic Entomology at Portici, were available, they were first allowed to multiply in a specially constructed cage. They were released in the middle of August last year, and when the author returned to Cap Ferrat in February, it appeared that the scale, though subsisting on various food-plants (Citrus, Acacia, Pittosporum, etc.), was no longer dangerous and that larvae, nymphs and adults of *Novius* were to be found throughout the gardens on the peninsula.

Gaumont (L.). **Le puceron de la betterave.** [The Beet Aphis.] *Revue de Phytopathologie*, i, no. 1, 20th April 1913, pp. 12-13.

In 1911, particularly, the beet-crops in France were much diminished owing to the ravages of *Aphis euonymi*. The pest was likewise reported from Poland and Hungary in 1909. The eggs, sexually produced by apterous females fertilised by winged males, are deposited in the bud-axils of the European and Japanese spindle-tree. They hatch in April, the females (fundatrices) giving rise to the 'emigrant' generations which attack the sugar and white beet. To destroy *Aphis euonymi* Jablonowski recommends spraying the shrubs infested with eggs with an emulsion consisting of 20 litres of paraffin oil, 10 litres of water and 1¾ kilogs. of soap. Prof. Malaquin of Lille advises the destruction of the adults on the beet with a spray made from 1 kilog. soft soap, 1 kilog. soda and 1 litre of paraffin oil in 100 litres of water, all perfectly mixed. A 2 per cent. solution of the tobacco extract sold in Budapest under the name of 'Thaneton,' effectively destroys the aphis on the plants grown for seed without damaging the latter.

Townsend (C. H. T.). **Muscoid Parasites of the Cotton-Stainer and other Lygaeids.**—*Psyche*, xx, no. 2, April 1913, pp. 91-94.

Four species of Muscid parasites of Lygaeidae have so far been discovered. Neilson recorded a Muscid maggot (suyltefluearl) in the abdomen of an adult *Lygaeus saxatilis* in Sicily. The three other species were found by the author in Peru. *Xanthomelanodes peruanus*, Towns., was found in *Stenomacra* sp. near *limbatipennis*, Stal., in the Piura Valley. The cotton stainers, *Dysdercus ruficollis*, L., were plentiful on cotton in the Chira and Piura Valleys and were parasitised by the Muscid *Acaulona peruviana*, sp. n., which in its turn was parasitised by a *Perilampus*. The fourth species, also found on *Dysdercus ruficollis*, could not be determined, as the puparium probably dried up; it was evident, however, that the parasite belonged to a genus quite distinct from *Acaulona* and *Xanthomelanodes*.

Paren (F.). **La lutte contre l'altise dans l'Hérault.** [The struggle against *Haltica* in Hérault.]—*Bull. Agric. d'Algérie et de la Tunisie*, no. 4. 15th Feb. 1913, pp. 86-89.

The most active predaceous enemy of the *Haltica* is *Zicrona coerulea* (the Blue Bug) and wherever the beetle is found this insect accompanies it. It winters with it and appears at the same time of year, its voracity being such that it will eat ten larvae per diem. It will also attack the adult insect and has been known to suck their eggs. The parasitic insects are of even greater importance: amongst them are the Braconid *Perilitus brevicollis*, and a Tachinid, *Degeeria funebris*, the former parasitising the larvae and the latter the perfect insect. This Tachinid has been found in the Lyonnais and in the South by M. Sicard. There are two generations in the year and each of these lays its eggs in the adults of the corresponding generation of the *Haltica*, never attacking the larvae, and even if the insect be not absolutely killed its reproductive organs are invariably destroyed. It has been found that in certain years 85 per cent. of the *Haltica* are parasitised in this way. The author says that among the fungi a Hyphomycetous species, *Sporotrichum* (*Beauveria*) *globuliferum*, is one of the principal enemies of *Haltica* and has been used against the Chinch Bug (*Blissus leucopterus*) in the United States. Trabut experimented with it against *Haltica* in Algeria with great success during the winter of 1911-12. The great majority of the *Haltica* in Hérault were destroyed by this fungus disease, and as a result their attack in the following spring was relatively slight, contrary to what had been prophesied. The warm, wet winter undoubtedly had a great effect in assisting the development of the fungus. Amongst methods still in use in Hérault is that of collecting the adult insects by means of an apparatus known as "l'entonnoir à Altises" (*Haltica* funnel) which is held underneath the branches, the insects being shaken into it, and passing out into a sack attached to the other end. This operation should be performed early in the morning when the insects have not properly recovered from the cool of the previous night and are incapable of springing far. One method of diminishing the cost of the labour required for carrying out this process is to powder the vines with sulphur or fine chalk; this causes the *Haltica* to gather together in certain parts of the plant so that a large number may be captured by one application of the funnel. Another plan is to distribute over the vineyards artificial shelters made of the straw covers of bottles, bundles of twigs and the like, in which the *Haltica* collect and may be captured in quantities. This plan is most useful in winter. The author says that the method which combines a maximum of economy and efficaciousness consists in the employment of the insecticide in the spring, between the time of the appearance of the insect and that at which it begins to lay its eggs. He advises the following mixture as one of the best:—acetate of lead, 600 grammes; arsenate of soda, 200 grammes; water, 100 litres. This mixture may be used

separately or combined with bouillie bordelaise. The question as to whether the *Haltica* is really poisoned by the arsenate is possibly still a matter of doubt, but the practical result is the same. The insect leaves the plant and dies, possibly of hunger, but the leaves are not touched and no eggs are laid. Nicotine is said to give good results in the Gironde, but the author is of opinion that it protects the leaves in a less effective manner than arsenical compounds. He says that spraying against the second generation is much less efficacious, especially as arsenical compounds must not be used. Fortunately this second treatment is generally unnecessary, in that the summer brood is much less abundant than that of the spring and cannot do anything like the same amount of damage, because the insects are spread over a much larger leaf surface. If, however, the attack is of sufficient gravity, nicotine spray is the remedy, or possibly barium chloride, but under no conditions are arsenical compounds to be used.

CHAPPELLE. **La lutte contre la Mouche de l'Olive: résultat des experiences du Service de l'Oléiculture (Année 1912).** [The fight against the Olive fly: results of experiments of the Olive Department for the year 1912.] — *Bull. Agric. de l'Algérie et de la Tunisie*, no. 5, 1st March 1913, pp. 100-10[illegible]

The experiments here reported upon were made in an olive grove which contained 10,000 trees, situated at a great distance from other olive groves and in a position peculiarly favourable to the attack of the fly, and more or less notorious for the intensity of such attacks and, further, it contained a great number of trees of the variety known as "saurine," which are said to be particularly affected by the fly. The trees were first sprayed on the 8th July when the fruit was only a few millimetres in diameter and no flies whatever could be found. The mixture used was composed of 50 kilos. of a $2\frac{1}{2}$ per cent. solution of arsenate of soda in 100 litres of water. This spray could only be regarded as a preventive. The author says that one man, properly equipped, was able to spray 700-900 trees of medium size in a day. The summer was relatively cold and rainy, and during the months of July and August, several violent rain storms occurred, so that by the end of August no trace was left of the first spraying. The trees were sprayed again on 6th September, only two-thirds being treated, with the result that, whilst the pest attacked the whole countryside with most disastrous effects, it was found that the number of trees attacked in that part of the plantation which had been treated was quite insignificant.

The author give a table showing the varieties of olive and the percentage attacked in the olive grove under observation and in others which were not treated. The general result is that on the 5th October, when the examination was made, it was found that in the plantation experimented upon more than 95 per cent of the trees escaped, whereas in others which had not been

treated the figure was only a little over 40 per cent, and in some cases by the 5th November it had fallen as low as 14½ per cent.

The attack of *Dacus* results not only in the premature dropping of the fruit, but also causes a very serious diminution in the yield of oil. Figures are given to show that the ratio of the yield from the treated olive groves and others was about 5 to 3. The cost of the treatment is estimated at about 5 centimes for each tree or from 7 to 10 francs a hectare (2½ acres).

Figures are also given showing the great effect produced by omitting treatment of the trees for one year, the proportion of olives attacked in that year being more than double. The author inclines to the opinion that spraying is the only remedy which is really effective, and that this should be done a first time in the beginning of July and a second in the early days of September; but in other olive-growing districts, as in the Alpes-Maritimes and Corsica, it would be wise to watch the development of the parasite and, if necessary, to give a thin spraying in the autumn. He does not disguise the fact that the conditions under which the experiments were made were extremely favourable to their success, but he feels assured that even under less favourable conditions the action of sprays is unquestionable and the expense more than justified.

Jones (P. R.) & Davidson (W. M.). **Life-history of the Codling Moth in the Santa Clara Valley of California.**—*U.S. Dept. Agric., Bureau of Entomology*, Bull. no. 115, part iii, 18th Jan. 1913, pp. 111-181, 13 figs.

The following is a brief summary of the life-cycle of the codling moth in the apple and pear orchards of the Santa Clara Valley (Cal.). The overwintered larvae pupate from the middle of February until May, the moths issuing about six weeks later through a period extending from the latter part of March until the middle of June. Eggs are deposited about 3 days after emergence, and hatch in about 12 days. The first-brood larvae enter the fruit shortly after hatching and remain there for about 4 weeks. They may be found in the fruit from the last week of April until the last week in July, a range of 3 months, or nearly three times their average larval life. After leaving the fruit the full-grown larva seeks some crevice in the bark on the main trunk or on the larger limbs of the tree and there spins its cocoon, transforming after a few days into a pupa. The first-brood pupal stage averages 21 days, only half as long as the corresponding stage of the spring brood, a fact due, undoubtedly, to the considerably higher temperature. First-brood pupae are present from about the middle of June until the middle of September, although the two years 1910 and 1911 show a considerable diversity on this point; for in 1910, the warmer of the two years, the first-brood pupae were present three weeks earlier. Similarly the first-brood moths emerged just so much earlier in 1910. A fair proportion of the first-brood pupae hibernate, so

that individuals may remain in the immature stages for 10 or 11 months. The first-brood moths begin to deposit eggs 3 days after issuing, and these eggs hatch in 11 to 13 days. The second-brood larvae remain in the fruit about 50 days, and they may be found from the latter half of July until the middle of October, a period of about 80 days. All larvae of the second brood hibernate and form the great bulk of overwintering larvae. Doubtless if the fruit remained longer on the tree there would be a complete second brood possible; but so many varieties of apples and pears are picked before the end of September.

Observations indicate that the weather does not always exert great influence on the relative sizes of the two generations; nor are the numbers of the second necessarily influenced by those of the first. The relative number of larvae of the first brood that overwinter varies from year to year, but this is not entirely owing to the influence of the weather or the temperature. The larvae of the second brood are present in all but the earliest varieties of fruit, and it is necessary to combat them. Weather conditions exert more influence on the spring emergence of moths than on the summer emergence.

Three applications of poison spray are necessary for the control of the codling moth in this locality. The first should be made immediately after the petals have dropped from the blossoms, the second should follow from 2 to 4 weeks later, and the third a month or 6 weeks after the second.

Scott (E. W.) & Siegler (E. H.). **Lime-sulphur as a Stomach Poison for Insects.**—*U.S. Dept. Agric., Bureau of Entomology, Bull.* no. 116, pt. iv, 17th Jan. 1913, pp. 81-90, 1 pl.

In 1912 a series of feeding experiments were undertaken by the branch of Deciduous Fruit Insect Investigations of the Bureau of Entomology, at its laboratory at Benton Harbor, Mich., to test the killing effect of various poisons on different species of insects. It was soon found that lime-sulphur, hitherto considered only as a contact spray, has decided value as a stomach poison, especially in the case of the fall web-worm and the codling moth. It is probable that caterpillars of mandibulate insects in general will be susceptible to lime-sulphur alone, or lime-sulphur in conjunction with lead arsenate.

Twigs of the wild black cherry (*Prunus serotina*) were sprayed with these chemicals until the leaves began to drip. After the spray had thoroughly dried, larvae of the fall web-worm (*Hyphantria cunea*, Drury) were placed on the leaves, and a large paper bag was put over each twig. Periodical examinations were made, and the dead larvae were taken out and counted. When all the insects were dead or had pupated the amount of foliage consumed was measured by means of a celluloid sheet cross-sectioned to one-hundredth of a square inch. Experiments were also made with a limited number of pear-slug larvae (*Eriocampoides cerasi*, L.)

WEBSTER (F. M.). **The Disastrous Occurrence of *Vanessa californica* in California and Oregon during the years 1911-1912.**—*Canad. Entomologist*, xlv, no. 4, April 1913, pp. 117-120.

During the summers of 1911 and 1912, correspondents of the Bureau of Entomology, Washington, recorded the appearance of an enormous number of larvae of *Vanessa californica* doing thousands of dollars worth of damage to alfalfa at Lakeview and Waldo, Ore., and to mountain lilac, grease-wood and fruit trees in Josephine Co., South River Co. and Del Norte Co., Cal. Both butterflies and larvae came in millions, and hens and blackbirds could not check them. However, a hymenopterous parasite, *Theronia americana*, and *Helicobia helicis* destroyed fully half of the pupae. In Oregon it was noted that the myriads of butterflies headed due west.

MARSH (H. O.). **The Horse-radish Web-worm.**—*U.S. Dept. Agric., Bureau of Entomology*, Bull. no. 109, pt. vii, 30th Jan. 1913, pp. 71-76.

Among the pests of the horse-radish at Rocky Ford, Colorado, are a flea-beetle (*Phyllotreta pusilla*, Horn.), the spinach aphis (*Myzus persicae*, Sulz.), the common cabbage worm (*Pieris protodice*, Boisd.), the diamond-back moth (*Plutella maculipennis*, Curtis) and the horse-radish web-worm (*Plutella armoracia*, Busck). The last-named species is a new and hitherto unrecorded truck-crop pest. Its larvae, pupae and adults were found on about 15 clumps of horse-radish in one garden at Rocky Ford, during the latter half of April 1911. In spite of a careful search it could not be found on horse-radish in other gardens or on various species of wild and cultivated cruciferous plants in the Arkansas valley.

*Plutella armoracia* is a slender moth belonging to the family HYPONOMEUTIDAE, of shy habits, and hides amongst the foliage of the infested horse-radish plants. The eggs are scale-like and deposited singly on the leaves during a considerable period, so that it is impossible to separate the generations owing to overlapping. The yellowish larvae spin a close-meshed, whitish grey web, under which they feed on the tender leaves, and later destroy the blossom buds. The yellow and brown pupae are enclosed in silver-gray cigar-shaped cocoons which are placed on the leaf petioles. There are four generations each year from March to October. A few of the larvae of the fourth generation produce moths in September, but the majority hibernate among dead leaves or in cracks in the soil and develop into moths the following April.

The increase of the *Plutella* larvae was largely checked by a small Hymenopterous insect, *Angitia plutellae*, Viereck. It is probable that the parasites live through the winter within the bodies of the hibernating *Plutella* larvae. The web-worm cannot be controlled by arsenic sprays. Burning the dead horse-radish leaves and stirring the soil about the roots would be advisable, should artificial control become necessary.

FOSTER (S. W.). **The Cherry Fruit Sawfly.**—*U.S. Dept. Agric., Bureau of Entomology*, Bull. no. 116, pt. iii, 31st Jan. 1913, pp. 73-79.

In 1909 most of the cherry orchards in the Suisun Valley, Cal., showed the presence of the Cherry Fruit Sawfly (*Hoplocampa cookei*, Clarke), as much as 80 per cent. of the fruit having been injured by the larvae in one orchard. The only occurrence of this sawfly outside California seems to have been in Jackson County, Ore., where it also attacked prunes.

The eggs are deposited in the sepals or in the upper portion of the calyx of the cherry-blossom. Usually only one egg is laid in a single flower, and the eggs are deposited regardless of the variety of cherry. The time required for incubation is from three to six days. Upon hatching the larva may feed for a short time in the tissue surrounding the egg-cavity, but it soon enters the newly-formed cherry very near the stem and eats its way to the centre. After its first moult, which occurs in two to four days after entering the cherry, it seeks a new cherry and, as in the first one, eats the kernel, if soft enough. The larva may remain inside for six to ten days or even longer. A third and even fourth cherry may be destroyed, after which the larva is full-grown and works its way into the ground, where it constructs a small oval parchment-like cocoon. It remains in the cocoon until the following winter, when it pupates and emerges the following March. There is only one brood each year.

The species is occasionally heavily parasitised by an ichneumon and by a microbracon. In the Rogue River Valley, the spraying with lead arsenate proved satisfactory. A spray of 1 part of nicotine sulphate to 2,000 parts of water, with 3 per cent. distillate oil emulsion, applied in the early morning was also effective. By careful cultivation of the soil many larvae could be destroyed after leaving the trees.

JOHNSTON (F. A.). **On the Feeding Habits of** *Pimpla (Itoplectis) conquisitor*, Say.—*Jl. Econ. Entom.*, vi, no. 1, Feb. 1913, pp. 144-147.

During 1912 the author observed *Pimpla conquisitor* as a parasite on *Autographa brassicae*. Two males of this species were bred from pupae of *A. brassicae* and a female was observed unsuccessfully trying to oviposit in another pupa.

In captivity the parasites were observed to oviposit in larvae of the moth, as well as in a newly formed pupa. But in some cases the *Pimpla*, after puncturing the larva, worked its ovipositor up and down, and then fed on the juices which flowed from the wound.

HERRICK (G. W.). **Cherry Fruit-flies.**—*Jl. Econ. Entom.*, vi, no. 1, Feb. 1913, pp. 79-81.

In addition to *Rhagoletis cingulata*, another little-known species, *R. fausta*, was found to be doing much injury in the cherry orchards investigated. This species had been reported

injurious to cherries in British Columbia in 1907. The flies were first observed in the orchard on 8th June 1912. They were first seen ovipositing in the field on 24th June. The first maggots were found on 30th June. Full grown larvae emerged from cherries on 8th July. By the middle of July most of the larvae of *R. fausta* were found to be mature. The length of life of flies confined in glass cages was one month. The flies were supplied with drops of water daily and fed with crushed cherries.

A portion of the orchard was sprayed with a sweetened lead arsenate solution on 10th June, just after the flies were seen, and again on 24th June. No heavy rains fell during the intervening two weeks. It was applied to the lower branches of each tree by hand.

On 11th July, two crates of cherries, containing an average of 6,400 cherries to the crate, were picked from the sprayed portion of the orchard. The first crate, picked from the tops of the trees, in the outside sprayed row, contained seventeen maggots. In the crate picked from the lower branches there were only two maggots. A crate of cherries picked from the check trees was badly infested with curculio and brown rot, and fully one-third of the fruit contained maggots. The check rows showed less and less infestation the nearer they were to the sprayed trees.

Flies captured on the check rows next to those sprayed, died in a day or so, showing that they had obtained poison by going over to the sprayed trees. All the evidence appears to show that the flies are easily poisoned and that they travel from tree to tree for a considerable distance from their place of emergence. The ordinary codling moth spray, without the addition of syrup, will control these flies.

MORRILL (A. W.). **Entomological Pioneering in Arizona.**—*Jl. Econ. Entom.*, vi, no. 2, April 1913, pp. 185-195.

The climate of Arizona is characterised by a low rainfall, low humidity, and a high percentage of sunshine. The following are the more important insect pests:—

ORTHOPTERA.—The Military Grasshopper (*Taeniopoda picticornis*) breeds in the desert and feeds on mesquite till nearly full-grown, when it overruns cultivated fields, doing special damage to alfalfa, young citrus trees, and beans. These insects climb trees, fence posts, and other objects at night, evidently for protection. This habit suggests a ready means of trapping them. This strikingly marked species is apparently unpalatable to turkeys.

THYSANOPTERA.—The citrus thrips (*Euthrips citri*) is the only notable citrus pest known to occur at the present time in the State, and it has not done so much damage as in some parts of California. The flower or grain thrips (*Euthrips tritici*) does considerable damage, especially to the flowers of alfalfa.

RHYNCHOTA.—In many parts of Arizona the blood-sucking cone-nose (*Conorrhinus sanguisugus*) takes the place of the bed-bug as a household pest. The squash Capsid (*Pycnoderes quadrima-*

*culatus*, Guen.) is an insect which as a pest appears peculiar to the Salt River Valley. Late squashes, cassaba melons, and beans are subject to serious damage by this pest, which promises to be a difficult one to control. The common squash bug (*Anasa tristis*) thrives wherever squashes are grown. The western leaf-footed plant-bug (*Leptoglossus zonatus*) prevents the development of pomegranate-growing upon a commercial basis, and sometimes attacks oranges and ripening peaches. Various species of Aphis, particularly the melon louse (*Aphis gossypii*), the cabbage louse (*Aphis brassicae*), and the woolly apple aphis (*Schizoneura lanigera*) are common and troublesome. The grape Phylloxera (*P. vastatrix*) was discovered attacking the leaves of cultivated vines in Arizona in 1912. The best known economic leaf-hoppers are the sugar-beet leaf-hopper (*Eutettix tenella*) and two grape leaf-hoppers (*Typhlocyba comes* and *Dicraneura cockerelli*).

The soft brown scale (*Lecanium hesperidum*) depends for the most part on the oleander. The California red scale (*Chrysomphalus aurantii*) was discovered for the first time in Arizona in 1912. The Parlatoria scale (*P. blanchardi*) and the Marlatt scale (*Phoenicococcus marlatti*) both attack the date palm.

LEPIDOPTERA. The corn-cob worm (*Chloridea obsoleta*), codling moth (*Carpocapsa pomonella*), alfalfa butterfly (*Colias eurytheme*) and the variegated cut-worm (*Peridroma margaritosa saucia*) which also attacks alfalfa, are, in the order named, the leading lepidopterous pests in Arizona. Vine leaves are attacked by *Harrisina coracina* and *H. metallica*. The eastern peach tree borer (*Sanninoidea exitiosa*) also occurs in the State, but has done little damage as yet.

COLEOPTERA.—Peaches and figs are badly and generally injured by the green June beetle (*Allorrhina mutabilis*) wherever grown in the State. A small Nitidulid beetle (*Carpophilus dimidiatus*) has been found to be a serious enemy to the date palm, breeding in the fruit in enormous numbers. The Colorado potato beetle (*Doryphora decemlineata*) is not of much importance in Arizona. The bean ladybird (*Epilachna corrupta*) is one of the most destructive beetles in Arizona.

HYMENOPTERA.—In this order Arizona has three pests of high rank in the clover seed Chalcid (*Bruchophagus funebris*), the harvester ant (*Pogonomyrmex barbata* vars.) and leaf-cutter bees of possibly more than one species. The clover seed Chalcid not only causes a great direct loss to alfalfa seed-growers in Arizona, but dissipates the hopes for the development of the seed-producing industry for which the State is peculiarly suited climatically, until some satisfactory method of control is worked out. The harvester ants are responsible for a large amount of damage in the alfalfa fields. In this connection a use for London Purple, not generally known, should be noted. This poison owing to its fine state of pulverisation is especially adapted for placing around the entrance of the nests of the ants, where it may adhere to the feet and be carried into the nests to poison the food supply. The leaf-cutting bees are the cause of much damage to young fruit trees in Southern and Eastern Arizona.

**Britton (W. E.). Recent Studies on the Weevil and the Bud-moth of the Walnut and a Sawfly attacking Blackberry.**—*Jl. Econ. Entom.*, vi, no. 2, April 1913, pp. 197-199.

In Connecticut, walnuts (*Juglans*) of the species *cordiformis*, *sieboldiana*, *cinerea*, *regia*, *mandshurica*, and *nigra* are infested with the walnut weevil or curculio, *Conotrachelus juglandis*, Lec. Oviposition takes place from the end of May till the beginning of August, the eggs hatching in from six to twelve days. The larvae tunnel upwards in the stems of the shoots and feed on the kernels. When mature, they go an inch into the ground, pupate ten days later, and the adults emerge sixteen to twenty days after pupating, fly to the trees and eat holes at the base of the leaf petioles. Lead arsenate in the usual proportions, applied twice, seems to be an effective check.

A bud-moth, probably *Acrobasis caryae*, Grote, tunnels downward from the terminal or an axillary bud of *Juglans regia*, *cinerea*, or *nigra*. The frass is not, as in the case of the walnut weevil, extruded laterally from the burrow, but retained and fastened to the leaves forming a nest for pupation. The moth may be destroyed in the same way as the weevil.

*Pamphilus dentatus* did much damage to blackberry plantations in Connecticut and has habits quite similar to those of the peach sawfly.

**Morgan (A. C.) & Runner (G. A.). Some Experiments with Roentgen Rays upon the Cigarette Beetle, *Lasioderma serricorne*, Fabr.**—*Jl. Econ. Entom.*, vi., no. 2, April 1913, pp. 226-230.

In continuation of Mr. W. D. Hunter's experiments on the effect of X-rays on insects, the authors tested an X-ray machine built for "sterilising" cigars on a commercial scale, *i.e.*, at the rate of 40,000 a day. Voltages of from 64,000 to 75,000 and exposures from a few seconds to one hour were tried, with the result that eggs, larvae, pupae, and adults of *Lasioderma serricorne* so treated did not show the slightest deviation from the normal development, as checked by control sets of the beetle.

**Jones (T. H.). Some Notes on *Laphygma frugiperda*, S. & A., in Porto Rico.**—*Jl. Econ. Entom.*, vi, no. 2, April 1913, pp. 230-236.

The fall army-worm, southern grass-worm or "el gusano de yerba" (*Laphygma frugiperda*) is widely distributed over Porto Rico, and larvae are common during the wet and slightly cooler autumn and winter months on sugar-cane, "malojillo" (*Panicum barbinode*), corn, and onions. In the areas infested with the fall army-worm, the grasslooper (*Remigia repanda*) is also common and prefers the unfolded sugar-cane leaves, while the former destroys the young leaves. Outbreaks of *Laphygma* apparently depend on climatic conditions, and the abundance of larvae following floods in Porto Rico may be accounted for by the fact

that larvae are found in the vegetable débris and soil brought down. Observations on the breeding habits have been carried out for some years at the experiment station of the Porto Rico Sugar Producers' Association at Rio Piedras. Three Tachina flies were found parasitic on *Laphygma*, *Frontina archippivora*, Will., *Gonia crassicornis*, F., and *Archytas piliventris*, Wulp. Adults and larvae of a Carabid beetle, *Calosoma alternans*, F., were found in areas infested with *Laphygma*. Other natural enemies occurring in Porto Rico are lizards and two species of blackbird (*Holoquiscalus brachypterus* and *Crotophaga ani*) known locally as "el chango" or "mozambique" and "el Judío." Experiments with bran sweetened with molasses and poisoned with Paris green showed this mixture, if placed between grass land and cane plantations about to be attacked, to be a most efficacious bait for *Laphygma frugiperda*.

Haseman (L.). **Peach "Stop Back" and Tarnished Plant Bug** (*Lygus pratensis*, **Linn.**).—*Jl. Econ. Entom.*, vi, no. 2, April 1913, pp. 237-240.

Considerable damage to peach and pear buds in Missouri nurseries has been done in recent years by tarnished plant bugs (*Lygus pratensis*). The injury, known as "stop back," was formerly attributed to soil conditions, mites, and thrips, but it has been proved conclusively that *Lygus* is responsible. The bug does not deposit its eggs in the tissues of plants, as the ovipositor does not seem sufficiently strong, but in the blossoms of daisies, asters, clover, mare's tail (*Erigeron canadense*), &c., during the autumn. After the first heavy frosts breeding stops and the tarnished plant bugs swarm in thousands in gardens, feeding on turnips and crawling among the leaves of mullein plants. The author has been able to observe five nymphal stages from the egg to the adult form. During the summer the pest completes its life-cycle in from 20 to 25 days, and during September and October in 30 to 35 days.

All places sheltering hibernating adults should be burnt over and mullein plants carefully destroyed. Trap crops to protect peach-trees in nurseries are probably useful in spring. Spraying peach stock is far less efficacious than the use of a special machine provided with sticky shields, similar to the one used for the apple leaf-hopper. During the late summer and autumn, road-sides, vegetable gardens, and waste lands should be kept free from weeds, or the weeds sprayed regularly with a strong contact wash.

Haseman (L.). **The Apple Leaf-Hopper** (*Empoasca mali*, **Le B.**).—*Jl. Econ. Entom.*, vi, no. 2, April 1913, pp. 240-243.

For years the apple leaf-hopper has caused great trouble in the Middle West, especially in Missouri. Contrary to previous opinion the pest does not hibernate in the egg stage under the bark of apple trees, but, like the grape leaf-hopper, passes the winter in the mature stage hiding under the foliage of docks, turnips, &c., along fence rows and in rubbish. A few scattered

adults are the first forms to appear in early spring, followed by a heavy brood of young which cause serious curling of the first leaves of the apple trees. Later broods appear at intervals of about four to six weeks, until the leaves begin to fall, and increase in numbers unless they are checked. After the first frost the adults leave the trees and collect in protected places for the winter.

It was found that spraying was quite an inadequate method of control, both from the points of view of efficacy and expense. As the adult oviposits in spring soon after the trees begin to grow, it occurred to the writer that a contact wash would be effective. Miscible oils and, to a lesser extent, a kerosene emulsion applied three or four times at intervals of from three to six days, destroyed the nymphs, but not the adults. A more satisfactory and cheaper method was to follow up the spraying with a trap, on the sticky shield plan, mounted on wheels. So many leaf-hoppers, tarnished plant bugs and other noxious insects were caught upon the sticky surface of the machine that it had to be cleaned and repainted twice a day, from one to three gallons of insects being removed during each cleaning. Contact oil washes for nymphs, followed up by a machine for catching the adults, is sufficient to control the pest at a moderate expense.

TOWNSEND (C. H. T.). **The 1912 Outbreak of** ***Alabama argillacea*** **in Peru.**—*Jl. Econ. Entom.*, vi, no. 2, April 1913, pp. 244-246.

During the first few months of 1912 the cotton leaf-caterpillar multiplied in extraordinary numbers in the cotton districts from Chancay to Casma, on the Peruvian coast N. of Callao, causing a loss estimated at over £70,000. The reasons for this outbreak must be sought in the abnormal meteorological conditions during the season 1911-1912. The humidity and lack of sun during the latter half of February prevented the usual evaporation, while the exceptional heat caused a soil fermentation to set in, that rendered the cotton plant inactive during its usual period of greatest growth, and thus less resistant to the attacks of the caterpillar. At the same time heat and humidity favoured an accelerated development of *Alabama*, there being at least five and perhaps six generations from December to April. The fermentation of the soil probably killed the pupae of its Muscoid enemies, while the moths were carried from one irrigated valley to another by the strong S.E. wind. By the time the planters awoke to the importance of the outbreak little could have been done, even if arsenates or other poisons had been available.

URICH (F. W.). **Notes on some Mexican Sugar-Cane Insects from Santa Lucrecia, State of Vera Cruz.**—*Jl. Econ. Entom.*, vi, no. 2, April 1913, pp. 247-249, 1 pl.

On a sugar plantation, about 3,000 acres in extent, situated about twelve miles from Santa Lucrecia on the Coatzacoalcos River, the following insects injurious to cane were recorded

(1912):—*Tomaspis postica*, Walk., which was kept in check by a parasitic fungus, *Metarrhizium anisopliae*, Metschnikoff, and a species of *Empusa*; Reduviid bugs (*Castolus plagiaticollis*, Stal.), unfortunately parasitised by a species of *Telenomus*, were seen carrying about *T. postica* impaled on their probosces. *Diatraea saccharalis*, parasitised by *Trichogramma pretiosa*, Riley, *D. grandiosella*, Dyar, parasitised by a *Telenomus* sp. *Xyleborus affinis* was observed only on cane damaged by gophers.

Trivial damage was done by:—*Leptodictya tabida*, H. Sch.; species of *Machaerocera*, *Taeniopoda*, *Schistocerca*, *Neoconocephalus*; *Cosmoromoidea morrilli*, Howard; *Cyanopepla submacula*, Walk.; *Perimeles remus*, F.; *Cirphis* sp., parasitised by *Horismenus urichi*, Crawford.

The size of the sugar-cane, the large areas to be treated, and a scant labour supply, make artificial control, as by spraying, unfeasible. However, in Mexico there is a fair amount of natural control by insects, fungi, and lizards.

HEIDEMANN (O.). **The Sugar-Cane Tingid from Mexico.**—*Jl. Econ. Entom.*, vi, no. 2, April 1913, pp. 249-251.

Several specimens of the Hemipteron, *Leptodictya tabida*, H. Schaeff., were collected on sugar-cane at Santa Lucrecia, Vera Cruz, Mexico, in September, 1911. Although the characters of the species have been well defined, a new and more detailed description is given.

VAN DINE (D. L.). **The Insects affecting Sugar-cane in Porto Rico.** *Jl. Econ. Entom.*, vi, no. 2, April 1913, pp. 251-257.

Although sugar-cane has been cultivated in Porto Rico for nearly 400 years, it is only within the last half of the past century that insect pests affecting the crop have been recorded. In conjunction with the U.S. Bureau of Entomology the workers at the Experiment Station, Rio Piedras, P.R., have investigated the occurrence of the following injurious insects:—

*Diatraea saccharalis*, F. (moth stalk-borer), is responsible for the greater part of the damage; it is parasitised by *Trichogramma pretiosa*, *Tachinophyto* (*Hypostena*) sp., and a fungus, *Cordyceps barberi*. *Laphygma frugiperda*, S. & A. (southern grass-worm), usually in company with *Remigia repanda*, is often injurious to young canes after rain; three Tachinid flies, *Frontina archippivora*, Will., *Gonia crassicornis*, F., and *Archytas piliventris*, Wulp., have been bred from *L. frugiperda*. Other injurious caterpillars are *Cirphis latiuscula*, H. S., and *Prenes nero*, F., which are checked by a Braconid parasite and by blackbirds.

*Lachnosterna* spp. (May-beetles) in their grub stage injure the roots; kept in check by blackbirds (*Crotophaga ani* and *Holoquiscalus brachipterus*), wasps (*Campsomeris dorsata*, F., and *Elis sexcincta*, F.), and parasitic Tachinid flies (*Cryptomeigenia aurifacies*, sp. n., and *Eutrixoides jonesii*). *Metamasius hemip-*

..., L. (West Indian sugar-cane weevil) has been found throughout the island, but is injurious in certain districts only. *Diaprepes* sp., a weevil root-borer, not identical with *D. abbreviatus*, L., from Barbados, attacks the root-stalk of the cane in several localities. A shot-hole borer, *Xyleborus* sp., attacks diseased canes and is usually associated with the rind disease, *Melanconium sacchari*. *Diabrotica graminea*, Baly, feeds on cane leaves.

*Scapteriscus didactylus*, Latr. ("la changa" or mole-cricket) injures all cultivated plants and eats into the base of the young sugar-cane shoots; it is controlled chiefly by lizards, and by birds and fowls following the plough.

*Termes morio*, Lath. ("el comején") injures seed cane after planting.

*Tettigonia similis*, Walk., is frequent on cane leaves, but its feeding habits have not been observed. *Ormenis* sp., a leaf-hopper, infests cane in isolated areas. *Delphax saccharivora*, Westw., the West Indian sugar cane leaf-hopper, is not abundant and is parasitised by STREPSIPTERA, MYMARIDAE, and DRYINIDAE. *Sipha graminis*, Klt., and another, less common sugar-cane aphid are preyed upon by the Coccinellids *Megilla innotata*, Muls., *Scymnus loewii*, Muls., and *S. roseicollis*, Muls., and by larvae of a Syrphid and Chrysopid. *Pseudococcus sacchari*, Ckll., the sugar-cane mealy-bug, attacks the cane throughout its growth, particularly the roots of young cane, in every plantation in the island. Its chief enemies are *Aspergillus* sp. and *Cryptolaemus montrouzieri*, Muls., and it is usually associated with the ants *Solenopsis geminata*, F., and *Prenolepis fulva*, Mayr. *Targionia sacchari*, Ckll., is a common sugar-scale in Porto Rico, but does no particular damage.

DAVIS (J. J.). **The Life-Cycle of *Lachnosterna tristis*, Fabr.**—*Jl. Econ. Entom.*, vi, no. 2, April 1913, pp. 276-278.

All the eight North American species of *Lachnosterna*, known to be injurious, were supposed to have a three-year life-cycle, that of *L. arcuata* in particular having been worked out and recorded by Mr. T. Pergande. The author investigated the reproduction of several pairs of *L. tristis*, collected on oak at Lafayette, Indiana, and came to the conclusion that this beetle takes two years to develop from the time the eggs are laid until the appearance of the adults above ground, one year being the approximate total length of the grub stage. It is recorded that the grubs survived being frozen in soil for several months.

HUNTER (W. D.) & PIERCE (W. D.). **The Movement of the Cotton Boll Weevil in 1912.**—*U.S. Dept. Agric., Bureau of Entomology*, Circ. no. 167, 28th Jan. 1913, pp. 1-3, 1 map.

Notwithstanding a set-back, due to the very unusual climatic conditions of the winter of 1911-1912, the cotton boll weevil has gained 7,300 square miles, the total area infested being 278,800

square miles, being made up as follows:—149,700 square m... in Texas (139,300 in 1911); 40,800 sq. m. in Louisiana (stationary); 2,100 sq. m. in Oklahoma (6,300 in 1911); 25,... sq. m. in Arkansas (33,900 in 1911); 39,200 sq. m. in Mississippi (40,500 in 1911); 18,400 sq. m. in Alabama (9,300 in 1911); 3,600 sq. m. in Florida (1,400 in 1911).

WHITE (G. F.). **Sacbrood, a Disease of Bees.**—*U.S. Dept. Agr. Bureau of Entomology*, Circ. no. 169, 15th Jan. 1913, pp. 1...

In 1896 and 1898 W. R. Howard described a disease affecting larvae, pupae, and adult bees—pickled brood—as being due to a fungus, *Aspergillus pollini*. A similar disease was reported by Maassen, in 1906, as an "aspergillus mycosis in bees." The author is somewhat sceptical regarding the existence of such fungous diseases in the United States. However he has studied a disease which is neither foul brood, nor pickled brood, but causes a great weakening of the brood, which dies after the time of capping. The dead larvae are found extended lengthwise in the cell, which in many cases has been uncapped. They lose their normal colour and assume a yellowish, then a brown or grey tint. The body wall is not easily broken and they can often be removed from the cells intact. There is no odour in the brood combs. On account of the sac-like appearance of the larvae, which are filled with a watery fluid, the name "sacbrood" is suggested for the disease. Microscopical study failed to show any pathogenic organism, but it was possible to produce "sacbrood" experimentally by feeding healthy colonies with the virus of the disease. In eight out of eleven colonies the disease was produced by virus that had passed through a Berkefeld filter.

YOTHERS (W. W.). **Spraying for White Flies in Florida.**—*U.S. Dept. Agric.*, Circ. 168, 16th April 1913, 8 pp.

Citrus trees in Florida are liable to injury by four species of White Flies, but only two of these, *Aleurodes citri*, R. & H. (Citrus White Fly), and *A. nubifera*, Berger (Cloudy-winged White Fly), do sufficient damage at the present time to demand remedial measures, and of these, the former is by far the most injurious.

This pest was introduced into the United States from Asia some time previous to 1879, and has spread over the whole citrus-growing region of the State westwards through the Gulf region. At present sixty per cent. of the groves in Florida are infested by it. It is found on nineteen species of trees and shrubs, the most important hosts being China trees, Cape jessamine, privet, and various species of citrus. The only native plants seriously infested are prickly ash and wild persimmon.

The eggs of the fly are exceedingly small and to the naked eye they appear to be mere particles of whitish dust on the under side of the leaves. They hatch in ten to twelve days and the larva, after crawling about for several hours, settles on the under side of the leaf. There are three moults and the larval stage lasts

approximately three days. The pupa closely resembles the last stage of the larva, and the pupal stage varies from 13 days in summer to a maximum of 304 days during autumn, winter, and spring. Both larvae and pupae secrete honey-dew. The adults remain attached to the leaves and collect in the largest numbers on the new growth; they live for about 10 days. A single female has been known to lay as many as 250 eggs, but the average is not more than 150. The adults of the first brood reach their maximum number in March or early April; the second flight of adults takes place in June, and the third in August. Eggs deposited by the third brood reach the pupal stage and thus remain on the leaves until the following spring. This brood is by far the most numerous, and the larvae and nymphs, by the extraction of sap and the excretion of honey-dew, which favours the growth of the "sooty fungus," cause the greatest damage to citrus trees.

The other species, *A. nubifera*, Berger, is distinguished by the fact that the eggs are dark and have a reticulated surface, while those of *A. citri* are greenish yellow and smooth. The pupa case of *A. nubifera* is thin and membranous and collapses after the emergence of the adult, while that of *A. citri* retains its shape indefinitely. The adults are easily distinguished, as *A. nubifera* has dark marks on its wings, whilst the wings of *A. citri* are pure white. The broods of the former appear about a month later than those of the latter.

The injury caused by these flies by loss of sap is much greater than is generally supposed, but this is of secondary importance compared with the damage caused by "sooty mould" which follows it, the two together producing a reduction in the yield of fruit which has been variously estimated at from 25 to 50 per cent. It is customary to clean fruit which has been badly attacked by "sooty mould," but this causes mechanical injury and allows of the entrance of other injurious fungi.

The author says that there are two methods of controlling these White Flies, one by fumigation of the tree with hydrocyanic gas and the other by spraying with a contact insecticide. The latter is comparatively inexpensive and is adapted to conditions in Florida. He describes the apparatus necessary in detail, and gives the following formula for the spray:—Whale oil soap, 8 lb.; paraffin oil, of 25-28 degrees Baumé, 2 gals.; water, 1 gal. For spraying orange trees one gallon of this strong mixture should be added to 50 gals. of water. This gives about 1 per cent. of oil which is the proper strength required for the White Fly and Purple Scale. The spraying may be carried out at any time of the year, except when the trees are in bloom. If it is done about two weeks after the disappearance of the adults of the first brood the best results are perhaps obtained, and as the larvae at that time are very tender the solution may be used effectively at one-half, or three-quarters the usual strength, one thorough spraying being much more effective than two or three carelessly applied. Two sprayings are sufficient to control the White Fly, either one in the spring and one in the early autumn, or one at midsummer and another in winter. The spring and summer sprays are beneficial

in killing *Eriophyes oleivorus*, Ashm. (Rust Mite), *Lepidosaphes beckii*, Newm. (Purple Scale), and *Chrysomphalus aonidum*, L. (Nail-headed Scale).

MALAQUIN (A.) & MOITIÉ (A.). **Le puceron de la betterave dans le nord de la France.** [The Beet Aphis in the North of France.] *La Vie Agricole*, ii, no. 24, 17th May 1913, pp. 696-699, 7 figs.

During the season of 1911 a visitation of *Aphis papaveris*, L. in the north of France did much damage to sugar and cattle beet, the insects also feeding on spinach, rhubarb, poppies, beans, and various other cultivated, as well as wild, plants.

The winged parthenogenetic females appear on beet-leaves from the beginning of May and deposit their brood on the under side of the leaves. In between 10 to 14 days and after four moults both the apterous and winged forms are mature and commence reproduction. About ten generations may be observed during the course of one summer. In the north of France they leave the seed-plants, which do not provide sufficient food, for the sugar and cattle beet about the middle of July. During September the sexual winged form migrates to the spindle-tree (*Euonymus*), on which the apterous non-parthenogenetic females are deposited. The winged males migrate to the spindle-tree about a fortnight later than the females. The authors estimated that there were 800 females to each male. The eggs overwinter and hatch during the first fortnight in March, giving rise, after four moults in the course of three weeks, to the "stem mothers." The latter produce an apterous generation which continues its life-cycle on the spindle-tree, and a winged generation which emigrates to the beet or other food-plants.

An effective preventive measure would be the elimination of the spindle-tree from the vicinity of beet plantations, as spraying would only prove to be a temporary remedy. Of other methods of control, entomophagous Hymenoptera (APHIDIINAE and ENCYRTINAE) have proved to be most satisfactory, 50 per cent. of the Aphis having been attacked by them in 1912.

LINDINGER (L.). *Aspidiotus bavaricus*, Ldgr.; **a Scale-insect new to the British List.** *Entom. Monthly Mag.*, May 1913, pp. 103-104.

The author found females of this species of *Aspidiotus* on *Calluna vulgaris* from Chester and Aberdeen, which were identical with specimens from Bavaria, Styria, and Norway, and with the British scale erroneously described by Newstead as *A. ostreaeformis*. The insect is found on the subterranean part of the stem of its food-plant.

BERLESE (A.). **The Control of the Japanese Fruit Scale** (*Diaspis pentagona*).—*Monthly Bulletin of Agric. Intelligence, Internat. Instit. Agric., Rome*, May 1913, pp. 697-703.

The author says that the experience of many years has shown that artificial control measures against this pest are only of value

[illegible] the season in which they are carried out, and cannot be expected to get rid of the scales permanently or sufficiently to allow of the healthy growth of the plants, consequently many growers have become disheartened and have abandoned their [illegible].

*Prospaltella berlesei*, a small species of Hymenopteron, is the special endophagous parasite of *D. pentagona* introduced by the author into Italy in 1908. It was imported into Switzerland in 1912 and has established itself in the neighbourhood of Locarno. It is now also established in 37 communes in the Trentino and is spreading gradually in Göritz, Istria, and Dalmatia. The author quotes writers in various journals to the effect that once the insect is well established the scale ceases to be a pest and gives details as to the efficiency of it in many districts of Italy, and says that now the landowners and the cultivators are so convinced of its utility that there is no difficulty in spreading the parasite. He quotes Professor E. Voglino: "the countrymen about Valenza have learnt to recognise the parasitised scales perfectly, and as they all have small properties, they pick out twigs with plenty of scales and their parasites on them, at pruning time, and take them to fasten to their own trees. In some parts of Venetia the farmers who have material infected by *Prospaltella* make a regular trade of it, selling twigs of a foot long with 60 to 80 per cent. of parasitised scales for ½ a lira each (5*d*.). So great was the demand that in March many fortunate owners of parasitised mulberry trees had to watch them at night to prevent the material being stolen." The Institute at Alessandria sent out last year 5,315 separate lots of mulberry twigs. The rate of progress of the parasite is illustrated by Count Rota, who obtained one small [illegible] in 1909. The next year he was able to obtain 100 twigs; in 1911, 500; and in 1912, 35,000. With these he has infected half his [illegible] mulberries and distributed large quantities to his friends and fellow cultivators, and this year has abundance for himself and others. Dealers in silkworms' eggs are now busy cultivating the parasite and sending it out to their clients, and the author states that there are agricultural bodies which, although possessing as much as 6 cwt. of infected branches, are so overwhelmed by requests that they have to apply to the nurseries of the Institute for more. The author is of opinion that the operation of the parasite is so thoroughly satisfactory that in a very short time it may be hoped that Italy and other countries will be free from the pest. A list of 23 papers relating to the subject is attached to the article.

**Un insecto que causa graves daños a los viñedos.** *Vesperus xatarti.* [An insect causing great damage to vineyards.]—*Revista del Instituto Agricola Catalan de San Isidro*, 20th Jan. 1913, pp. 23-26.

The vineyard of D. Manuel Urgellis at Llorens del Penadés has been seriously attacked during the past year by a disease greatly resembling that which the natives called "ferridura" or "apoplegia" and which kills large numbers of the vinestocks. The owner

observed large numbers of white larvae, about 1 cm. broad by 2 cm. long, which were brought to the surface when the soil around the vines was stirred and, suspecting that these were the cause of the trouble, he sent them to Dr. Jaime Nonell for identification. They proved to be the larvae of a Cerambycid, *Vesperus xatarti*, Mulsant, vulgarly known under the name of "Menge-mallols." It was first met with in Valencia by Léon Dufour in the Moxenta mountains, was described by Mulsant in 1839, and is apparently indigenous to Spain. The insects pair in January and adults are rarely found in February. The female lays about 500 eggs in cracks and crevices of the bark of the vine stalk, from which the larvae hatch in the month of April. These larvae eat the shell of the egg as soon as hatched and pass into the soil, where they undergo a further transformation and live upon the roots of the vine. It would appear that the larval stage may last as long as three years and at all times, in vineyards subject to the attack of this insect, it appears to be possible to find larvae of three distinct sizes corresponding with the first, second, and third years of life. According to M. Oliver, the larva has two annual periods of activity, one between the middle of March and the middle of April and another from the 15th September to the end of October. It does not feed vigorously during the periods of extreme heat or cold, and probably not at all during the winter, and during this resting stage it may be found at a considerable depth below the soil, without any covering whatever. It may sometimes be met with motionless on the surface of the soil or in cracks in old vinestocks and similar places. At the end of the third year, when the larva has completed its development and is ready to be transformed into a nymph, it constructs a covering of agglutinated earth at such a depth as not to be interfered with by the operations of cultivation, and in this condition it passes through the heat of summer. The perfect insect generally appears towards the end of September, and its numbers go on increasing during October, November, and December, but it is only towards the end of the last month that the males begin to appear. The adult does not appear to feed during the day-time, but hides from the light under stones, pieces of bark and the like. This habit possibly explains the fact that the larvae of *V. xatarti* are more frequently found in vineyards which are intermixed with olives, almond-trees, &c.

The larvae of *V. xatarti* are omnivorous and appear to consume the roots of grasses, holmoak, &c., but apparently prefer those of the vine. The attack of the larva is most to be feared in the young plantations, and hence the vulgar name "Menge-Mallols" by which it is known. In the first year of the existence of the plantation the runners are frequently found to be cut in two close to the root. During the first and second year growth languishes in the month of June and a short time afterwards the stocks die. If the affected plant be pulled up it will be found that there is a circular incision around the principal joint. In the third year a complete annular incision is not generally found, but the attack of the larva is nevertheless evident enough. The

vine stock certainly resists, but after some time, as the result of repeated attacks, it dies. Most of the loss of vines attributed to "apoplegia" by the peasants is to be explained as the result of the attack of these larvae. The best method of diminishing the attack is to capture the largest possible number of adult insects. This should be done before the end of December, because, as stated above, mating takes place between the end of December and the early days of February. Wood fires or powerful lights in the neighbourhood of the vineyards are found to be effective. The females seek the trees such as olives, almonds, &c., which are to be found in the neighbourhood of the vineyards, and it is very desirable where such trees are planted to prevent the insects from climbing up by the use of some such mixture as the following:—tar 700 grms., resin 500 grms., soft soap 500 grms., whale oil 300 grms. The tar and the resin are heated together and when they are thoroughly liquid the soap and then the oil is added, stirring the while, the stirring to be continued, after removal from the fire, until the mass is completely cold. In the month of February the only thing to be done is to attempt to destroy the eggs which are laid underneath the bark in cracks, &c., and to strip the bark where possible. The larvae may be destroyed during the active periods in spring and summer, for they then live closer to the surface of the soil and can be turned up by raking and shallow digging. Bisulphide of carbon injected into the soil in winter at 25 centimeters from each vine stock in doses of 7 grms. has been found to be useful, though it may be necessary to repeat the operation 2 or 3 times. It is also recommended to cultivate leguminous plants, beans, &c., between the vines; the larvae attack these and as soon as they are seen to be suffering, the plants can be dug up and the larvae at their roots destroyed.

JENTINK (Dr. F. A.). **Hemp as a Deterrent of *Pieris brassicae*.**

Dr. F. A. Jentink, Director, Rijks Mus. Nat. Hist. Leiden, writes (22nd May 1913):—"Perhaps it may interest the readers of your journal to know that when I was a boy, some 50 years ago, my father always planted hemp (*Cannabis*) between the rows of cabbages, as we did not like the visits of *Pieris brassicae*. What Prince P. D'Arenberg relates as a *novum* ('Review of Applied Entomology,' Vol. I., A., March 1913, p. 68) was therefore a *long known* fact, at least 50 years ago, among the peasants in [illegible] (Holland)!"

NEWPORT (H.). **Market Gardening in the Mining Districts.**—*Queensland Agric. Jl.*, Jan. 1913, pp. 8-9.

On a small farm at Wolfram the crops were attacked severely by various caterpillars and insects and the farmer tried a solution of carbide lime (the waste after making acetylene gas) while still fresh, diluted with about 5 times its volume of water and splashed

over the vegetables (he having no spraying apparatus) and obtained excellent results. Cabbages, pumpkins and all other vegetables were freed from pests and none were damaged, with the exception of seedling lettuces, for which he found it advisable to use the solution of half the above strength. He now uses this simple insecticide constantly and is thoroughly satisfied with the results.

Ross (C.). **The Fruit Fly Pest.**—*Queensland Agric. Jl.*, Jan. 1913, pp. 36-37.

The author says that the early months of the growing season are the most important periods for the destruction of fruit flies, and that it is perhaps necessary to remind those who have not already destroyed the remnants of the summer orange crop, that they should immediately do so, either by burying or boiling all unmarketable and infested fruits. The fruit flies do not appear in the Warwick and Stanthorpe districts until the season is well advanced, and this he regards as proof that the fly is not bred there during the winter, but is introduced from the warmer districts.

Spraying is considered to be absolutely useless. The best practical means known for preventing the spread of the pest is to examine all fruit before packing. Deep raking or shallow cultivation between the trees will enable fowls and birds to get at the maggots that have previously entered the ground. The maggot after leaving the fruit, burrows to a slight depth in the soil, and emerges as a full-grown insect in about three weeks. Orchards should be periodically cleaned, preferably soon after rain. Lime, soda, kerosene and caustic top dressings applied separately to the soil surface are all fatal to the grub. Covering the trees with fine meshed netting before the fruit changes colour is a very effective means of protection. Kerosene tins placed here and there in the fruit gardens, as receptacles, will often act as preventives to visitors spreading the fly, as they are apt, after opening a tempting-looking peach and finding it maggoty, to throw it on the ground, thus providing the maggot with a congenial home.

The author complains that the private owners of a few trees are generally the chief offenders in spreading the pest, either through ignorance or carelessness, and abandoned orchards are especially pointed to as prolific breeding grounds.

Jarvis (E.). **Notes on the Bean Fly** (*Agromyza phaseoli*).—*Queensland Agric. Jl.*, Jan. 1913, pp. 124-5.

The author says that attempts to cultivate French beans in Southern Queensland are apt to be disappointing. The crop promises well at the start, but before long the young plants show unmistakeable signs of arrested growth, become weak and sickly, and die. There is no decided external evidence of injury and the growers are at a loss to account for the cause of failure. The

trouble is caused by *Agromyza phaseoli* (the Bean Fly). The method of oviposition is described and the author says that on a young leaf from a Tonga bean he found 91 punctures, only 9 of which however enclosed eggs.

SEYMOUR (G.). **Report on the Experimental Potato-field.**—*Jl. Agric., Victoria*, 10th March 1913, pp. 166-174.

More damage was done during 1911-12 by the potato grub to the mid-season crop than by the blight in 1910-11, in some cases amounting to fully 50 per cent. No satisfactory method has yet been devised for coping with this pest. The use of tarred canvas screens to trap the moth when on the wing and spraying with arsenical preparations are recommended. The latter will probably give the most satisfactory results if commenced in time. In many cases where the crop was dug before the plants dried off, tubers which were apparently sound were put into bags and covered with green tops; when the sap dried out of the latter the grubs forsook them and attacked the tubers in the bags, which are often left in the field for a week or 10 days. The result was that when the potatoes reached the market they were found to be so badly tunnelled by the grub that from 50 to 75 per cent. were unfit for use. Deep planting has been recommended (5½ to 6 inches), but this of itself is not sufficient, as it is the habit of some varieties to form their tubers near the surface. The best protection is probably fairly deep planting and thorough moulding up of the plants. If the moths appear in the fields, this should be done as soon as the tubers are well grown; and to get satisfactory results from moulding the drills should be not less than 30 inches apart. If the tubers are large enough for table use they should be harvested and disposed of as quickly as possible. If intended for seeding, it would be advisable to immerse them in a solution of corrosive sublimate (1½ oz. to 7 gals. of water) for 1½ hours.

COCKAYNE (A. H.). **A New Species of Grass Grub. A Serious Pest of Seedling Forest Trees.**—*Jl. Dept. Agric. Indust., New Zealand*, 1913, pp. 295-298, 1 fig.

The author says that considerable loss is annually sustained in the seedling beds at the State Forestry Nurseries through the roots of young trees being destroyed by the larvae of certain species of "grass grub," and he was of opinion that the pest was *Odontria zealandica*, well known in New Zealand on account of the serious damage done by it to pastures. In the Whakatewarewa State Nursery, during December 1912, it was clearly demonstrable that this insect was not the cause, as full grown larvae were abundant in the large beds on that date. Had the damage been due to *O. zealandica* there would have been very

few larvae present, as normally the majority would have pupated and emerged during the latter part of November. No method of distinguishing the various species of grass grubs in the larval stage has yet been worked out, but specimens of the beetle were forwarded to Major Thomas Broun, who decided that they belonged to a new species and named it *Odontria puncticolli*. The beetles were obtained in the following manner. A portion of one of the large beds, where all the trees had been killed, was selected, measuring 1½ ft. by 6 ft., all the soil to a depth of 9 ins. in this space being put through a sieve; 10 grubs were obtained, most of them at 6 ins. to 9 ins. from the surface. Below this the sub-soil to a depth of 6 ins. was taken out and screened, with the result that 20 fully developed beetles and 11 pupae were obtained. The beetles emerge about the beginning of February, when a large flight was observed, over 100 beetles being collected by hand in a few minutes.

The badly infested plots were deeply ploughed and then top-dressed with "apterite" in August 1912 and well harrowed. Cow peas and soya beans were sown in November 1912, since when no grubs or beetles have been found. It is suggested that one of the best methods of control would be to cover the beds every evening with beetle-proof frames during the short period that the insects are on the wing. The present seed frames employed could be easily adapted for this purpose. Larches were killed over large areas, but it appears that *O. puncticolli* will not damage Corsican pine, and it would seem as if the beetles will not lay eggs in soil occupied by seedlings of this tree. This is somewhat confirmed by the fact that larch trees growing accidentally in the Corsican pine seed-beds are not affected. The author thinks that it might prove advisable to combine the sowing of a certain amount of larch with the Corsican pine, and as the latter tree is extremely aromatic, experiments with deterrent sprays may probably yield good results.

MORSTATT (H.). **Die Vertilgung der Erdraupen.** [The destruction of cutworms.]—*Der Pflanzer, Daressalam*, ix, no. 4, April 1913, p. 195.

The method employed in Meru, German E. Africa, for the destruction of cutworms by surrounding the plants (coffee, tobacco) with rings of wood-ashes, is not always feasible. In the case of seedlings it is advisable to use poisoned bait, consisting of a well-mixed paste of 1 kg. of bran or maize meal with 50 gr. of sugar and 20 gr. of Schweinfurt Green. Finely chopped clover or maize leaves saturated in a solution of 20 gr. Schweinfurt Green and 100 gr. of sugar in 10 litres of water, will do equally well. The bait is distributed in small heaps, and, if possible, covered with banana leaves, which will prevent it from drying up and, at the same time, will attract the caterpillars during the day. Otherwise the caterpillars will only come out during the night and have to

...llected with the aid of lamps. It is well to plough the fields ...nded for seedlings several times and remove all the weeds, ...des setting the bait. The Rhodesian method of covering ...co-fields before planting with twigs or dry tobacco-stems and ...ying the accumulated cutworms by fire is also recommended.

...n (C.), Junr. **A New Insect Pest of Roses. The Vine Curculio (Weevil)** *Orthorrhinus klugi*, **Boh.**—*Jl. Agric., Victoria*, 10th April 1913, pp. 240-241, 1 pl.

...his insect, the natural food of which is the Wattle (*Acacia*), ...known in most parts of Victoria. During recent years it has ...n proved that these insects forsake their natural food and turn ...r attention to vines, causing considerable loss to growers, ...d they have now commenced to attack roses. Specimens of ...se stems which were being killed by insects were received in ...ly last and found to be badly infested with the larva of this ...evil, and the perfect insects emerged in December, as many as ...being obtained from a piece of stem 7 inches long. The head ...the School of Horticulture at Burnley informed the author ...at at Diamond Creek in 1909 he saw these insects on the young ...minal twigs of Jonathan apples and apricots. The author ...ommends spraying with coal-tar water made by boiling 1 lb. ...coal-tar in 2 gals. of water and, while hot, making up to from ...to 100 gals. Benzol emulsion, obtainable in Melbourne, of which 1 lb. makes 5 gals. of spray, is said to be effective. All ...ad or dying acacias near a garden should be destroyed by ...rning.

...nsbury (C. P.). **Mally Fruit Fly Remedy. A Demonstration of its Applicability in Towns.**—*Agric. Jl. Union South Africa*, v, no. 4, April 1913, pp. 570-574.

Baiting for the Fruit Fly has become an established practice ...some of the largest fruit farms in the Cape Province, and the ...thor thinks that it will also prove useful for gardens in towns. Reports from large orchard owners are satisfactory, but residents ...t Pretoria reported unfavourably and the author directed tests ...be carefully made on late peaches in a much-infested garden in Pretoria, the results being quite satisfactory.

The remedy consists in the application, preferably with a ...rden syringe, of a small quantity of dilute arsenically poisoned ...rup at frequent intervals to those trees which it is designed to ...otect, at the rate of about one pint to a tree about 10 feet high ...d 10 feet wide. It should be renewed promptly after any rain ...d at least once a week or once a fortnight, according to the prevalence of the pest in the neighbourhood. The first appli...ation should be made to the earliest susceptible fruits about the

time they are two-thirds developed. The later-maturing fruit should be included in the process as they reach this relative stage, and the syringing should be continued until all the fruit is off.

The remedy acts by fatally poisoning the flies that otherwise would deposit their eggs in the fruit. In places in which the pest is specially prevalent, it is advised that one or more preliminary syringings should be given about October, as a few flies early in the season may become the progenitors of many hundreds later. It is essential to success that the syringing should be carried out thoroughly and persistently throughout the season. The garden in which the test was conducted was a private one, in which the method had been unsuccessfully practised last year. The trees in it included orange, lemon, naartje, apple, pear, peach, nectarine, apricot, quince, plum, persimmon, fig, guava, and loquat, but only a few of each variety, and the different kinds were more or less mixed. A great part of the garden was fenced by a Kei apple hedge, nearly 300 yards in length, the abundant fruit of which becomes infested by the fly. It was considered advisable to restrict the baiting to trees in one part of the garden and make control observations on peach trees growing in another part. The trees chosen as controls were about 150 yards distant. Fifty-seven trees were treated with the following mixture: 6 lb. of brown sugar, 6 oz. of arsenate of lead paste, and 8 gals. of water. The first dressing was given on the 16th January, when there were few flies; but there were a number of maggots in some still very hard green fruit on the late varieties of peach, which the treatment was designed to save. Out of 15 picked for examination, 11 were infested, and every one of 32 found on the ground were in like state. There was much rain during the period of experiment. The final spraying was applied on the 18th Feb. and the last of the fruit was gathered on 24th Feb. Rain fell on 23 of the 33 days between the first dressing and the last, though on 4 or 5 of these days the quantity was not worth considering. Thirteen dressings were applied. After 5th Feb. all windfalls were examined for maggots every third day. On 5th Feb. 25 per cent. were maggotty, and from the 8th to the 24th, 29½ per cent. Of the plucked fruit from the 5th to the 21st 11 per cent. were maggotty and on the 24th 16 per cent. The windfalls from three untreated trees showed respectively 95, 95½, and 98½ per cent. of maggotty fruit, against an average of 29 per cent. from the treated trees, although the distance between the baited trees and the unbaited ones was only about 150 yards. In the neighbouring gardens it was reported that the early fruit had been practically free of maggots, the mid-season fruit much infested, whilst the entire crop of fruit borne by the single late peach tree present was a complete loss. The author thinks that it is only fair to assume that the fruit of the baited trees would have been a total loss had it not been for the baiting and that therefore, if faithfully carried out according to the directions issued by the Entomological Division, the "Mally Fruit Fly Remedy" is applicable under town conditions even in summer rainfall areas.

MULLER (J.). **Arsenate of Lead. Composition of Various Brands sold as Insecticides.**—*Agric. Jl. Union of South Africa*, v, no. 4, April 1913, pp. 583-585.

The author made an examination of eight commercial brands sold as insecticides and sets out their price, their composition and the approximate cost of the arsenate of lead in each, required for use with 25 gallons of water, in order to make Mally's formula of the proper strength.

LOUNSBURY (C. P.). **Locust Bacterial Disease.**—*Agric. Jl. Union of South Africa*, v, no. 4, April 1913, pp. 607-611.

Under the author's directions experiments were made with *Coccobacillus acridiorum*, d'Hérelle, procured from the Pasteur Institute. Migratory locusts are practically absent from South Africa at present, but great complaints have been made for several seasons of damage done by *Zonocerus elegans*, especially at Rosspoort Gardens, near Pretoria, where the experiments were made. The eggs hatched about the 10th October, but on account of the small size of the young insects and for other reasons work with the disease was not started until 1st Jan. The method was briefly as follows:—The organism was cultivated in peptonised bouillon and after 48 hours a series of insects were inoculated by means of an hypodermic syringe. The second series was inoculated with the excreta squeezed from the abdomen of individuals of the first series when they were dying, the process being carried on from series to series for about 12 times, until the disease was sufficiently virulent to kill the insects in about 8 to 10 hours after inoculation. A detailed account is given of the results of laboratory experiments. On the 3rd and 4th February six patches of land thickly infested with the grasshopper were infected with the culture, and on the 24th March a few sickly specimens were found which proved on microscopical examination to be attacked by the disease. The general result was failure, which the author attributes to the fact that the insects had become fully matured and had almost ceased to feed at the time of infection, and that heavy rain fell from time to time which probably washed the infection from the vegetation. He thinks that the disease at best can only be used as a supplementary measure in dealing with an invasion of locusts under the conditions which prevail in South Africa, and under ordinary circumstances arsenical poison may be expected to be equally efficient and cheaper in use, especially as the employment of d'Hérelle's disease will not be always practicable. The author points out that the method of preparing the virus practically necessitates the provision of stations for its preparation at a number of centres about the country, and that it is very doubtful whether reliable virus would be turned out at a station unless the man in charge were something of a bacteriologist. On the whole, he does not think that the use of arsenical syrup will be abandoned in favour of d'Hérelle's disease as a principal means of dealing with the locust pest.

South (F. W.). **Work connected with Insect and Fungus Pests and their Control.**—*Report Agric. Dept. St. Vincent*, 1911-1912, Barbados, 1913, pp. 7-12.

*Cacao diseases.*—The common fungus disease of cacao pods known as "scabby pod"—characterised by a scabby appearance of nearly ripe pods, dying back of the young twigs, and a brown discoloration of the inner bark visible on cutting into the lower part of the stem, and loss of leaves—is often accompanied by very large numbers of thrips (*Heliothrips rubrocinctus*). In Grenada it is believed that the presence of these insects in large numbers is a sure indication of adverse soil, cultural or climatic conditions; similarly in Trinidad, though Urich draws attention to this insect as a direct pest. Where thrips is present in St. Vincent, attention should immediately be paid to the soil, which should contain sufficient plant food and humus, and be in a good state of tilth and drainage. In places where thrips are very prevalent it is advisable to spray with resin wash, or with Bordeaux mixture, especially in damp situations, to check lichens and fungus at the same time. At Mt. William estate the cacao cultivation has greatly improved owing to the cessation of the attacks of thrips. The rapid diminution of the latter cannot be satisfactorily accounted for, unless there was a natural enemy at work.

*The black scale pest of cotton.*—During the past season great damage was done to cotton in the Leeward District of St. Vincent by the black scale (*Saissetia nigra*), and it is spreading rapidly over the island, several estates in the Windward district having been affected. Large crop losses are to be feared, unless measures are taken to check the pest, which unfortunately has but few natural enemies locally. Once the scale enters a field it spreads so rapidly that a good crop cannot be produced, the plants "drying up" prematurely and looking as if they had been "blasted." It is essential to pull up and burn all the cotton stalks as soon as possible after the crop is picked. Unfortunately the growers do not realise the amount of damage done annually by the black scale. As the scale occurs on weeds and bush along the fields and on many plants (sorrel, hibiscus, sugar- and custard-apples, almond, wild figs, angelin, &c.), precautions should be taken either to remove them or to trim away leaves and small branches before the planting season begins. The most critical period of the year for the occurrence of the blight is during the growing season, *i.e.*, June to December.

Reitter (E.). **Bestimmungstabelle der Borkenkäfer (Scolytidae) aus Europa und den angrenzenden Ländern.** [Identification Tables of the Scolytidae of Europe and adjacent countries.]—*Wiener Entomologische Zeitung*, xxxii, Beiheft, 15th May 1913, pp. 1-116.

A useful key to more than 360 species of Scolytidae, with notes on their habitats. The preface (pp. 3-10) contains a discussion of the basis of classification and a criticism of the system elaborated by Prof. Nüsslin in his "Leitfaden der Forstinsektenkunde."

NÜSSLIN (Dr. Otto). **Leitfaden der Forstinsektenkunde.** [A Text-book of Forest Entomology.]—2nd improved and enlarged edition. 522 pp., 432 figs., 7 portraits. Paul Parey, Berlin, 1913. Price 12 marks.

Whilst following strictly scientific lines, the author's chief endeavour has been to keep the practical object of the work always in view, namely, the instruction of students of Forestry in such entomology as would be really useful to them, rather than the production of a general treatise on entomology with special reference to those groups of insects whose life-history and operations come within the purview of the forester. He accordingly contents himself with a chapter of 32 pages only on the internal structure and biology of insects; 13 pages more are devoted to a statement of the general relations of insects to forestry, and the remainder of the work is entirely occupied by a detailed examination of those orders, genera and species with which the forester may have to deal in the execution of his higher duties, namely, the protection of the living trees entrusted to his care from the attacks of insect enemies, a full knowledge of the habits and life-history of which is often of greater importance than the study of minute systematic detail. The author's method is to give a concise description of the distinguishing features of each genus or family and then to deal more in detail with those genera and species with which it is important that the forest entomologist should be thoroughly acquainted; a brief outline of the biology of the family and its general relation to forestry; methods of combating its attacks and an account of the damage done by the insects to certain species of trees. An appendix contains an outline of collecting excursions for students attending lectures at the forestry school in Karlsruhe. The book is well and profusely illustrated throughout and the author expresses his great obligation to Drs. Nitsche, Henschel, and Eckstein for the bulk of the illustrations, a large number of which however are from original drawings and photographs prepared expressly for the work. How far the author's classification of the SCOLYTIDAE on a phylogenetic basis, with reference to their internal as well as their external morphology, is a departure from the governing principle of the book, is perhaps a matter for criticism, but that the work is a thoroughly practical and well-arranged textbook of the subject can hardly be gainsaid.

COMTE (A.). **Chenilles nuisibles aux plantes basses.** [Caterpillars injurious to herbaceous plants.]—*Rev. Agric. et Vitic. de l'Agric. du Nord, Algiers*, ii, no. 4, 1913, pp. 33-34, 1 fig.

The author reports enormous numbers of caterpillars of *Thaumetopoea (Cnethocampa) herculeana* as marching over the country near Tunis and devouring all manner of small plants whether wild or cultivated, cereals, forage, and kitchen garden crops. He recommends the burning of the nests as soon as they are discovered and the destruction of all weeds during the winter.

**Note sur la nécessité de l'emploi des substances vénéneuses et notamment de l'arséniate de plomb en agriculture.** [Note on the necessity for the use of poisonous substances and especially of lead arsenate in agriculture.]—*Bull. de l'Office des Renseignements Agricoles du Ministère de l'Agriculture*, Paris, Feb. 1913.

This circular is largely occupied with the difficulties which arise in practice from the poisonous nature of many substances of great value to agriculturists as insecticides, and contains certain regulations as to their handling and the marking of cases, barrels, &c., which have contained them. Fully recognising the dangers involved in their use, the Commission appointed to enquire into these matters expresses the opinion that any legislation which would seriously interfere with the proper use of these poisonous substances and particularly of arsenate of lead as an insecticide, would spell disaster to a large body of French cultivators, as it is the only radically efficacious insecticide against a very large number of formidable insect pests. It is said that no case of accident, either fatal or otherwise, attributable to arsenate of lead is on record. The cases of poisoning which have been recorded have been found to be due either to white arsenic or soluble arsenates. In September 1911 a large number of chemical analyses were made of grapes, wines, piquettes,* and vineyard residues from vineyards in which the vines had been treated with arsenate of lead. The summer was remarkably dry and the arsenate had not been washed off by rain, and the report showed that in spite of these extraordinarily unfavourable conditions, no arsenic or lead was found in any of these products. The only cases in which lead was found were those in which the grapes, in defiance of the advice given by the agricultural authorities, had been treated with arsenate some time after the fruit was formed, a method which is formally interdicted by the regulations now under consideration. Whilst fully recognising the danger attaching to the use of arsenical compounds in agriculture, the authorities believe that with proper precautions and regulations the danger can be so minimised as to be almost non-existent.

Johannsen (O. A.). **Two Spruce Leaf-Miners.**—*Maine Agric. Expt. Station, Orono*, Bull. no. 210, Feb. 1913, pp. 32-36, 1 fig.

The larvae of two leaf-mining moths, *Recurvaria piceaella*, Kearfott, and *Epinotia piceafoliana*, Kearfott, have been collected on Norway spruces on the Campus of the University of Maine, Orono, and the author has reared three hymenopterous parasites from the latter, *Porizon* sp., *Clinocentrus* sp., and *Microdus* sp.

* [Piquette is a drink made by extracting the wine press residue with water and allowing it to ferment.]

**Johannsen, (O. A.). Spruce Bud-worm (*Tortrix fumiferana*, Clemens).**—*Maine Agric. Expt. Station, Orono*, Bull. no. 210, Feb. 1913, pp. 1-31, 3 pls., 2 figs.

The author says that for the past 2 or 3 years the spruce bud-worm has proved the most serious pest of the spruces in Maine. It appears to be a native of the country. The species was first described there in 1865 and accounts are in existence of insect ravages believed to be those of the spruce bud-worm as far back as 1807. It is at present widely distributed over Eastern Canada, northern New England, New York, Vancouver and Manitoba. The author gives a brief account of the history of the pest from the earliest known observations. For a period of 25 years previous to 1908 there was no recurrence of any serious injury caused by this insect. It was recorded in Manitoba in 1907, and in July 1909 its numbers in western New York were so great that the females laid their eggs even upon window-sills and casements. In 1910 the pest spread over a wide territory covering south-eastern Canada, east of Lake Huron, southward to the Gulf of St. Lawrence, eastward to Nova Scotia, all northern New England and northern New York. In Philadelphia, in 1911, the moths were so numerous as to interfere with the street-car traffic, and in 1912 they were reported in Connecticut as having never been so abundant. The first intimation of the presence of the pest is in late spring or early summer, when the trees look as if a light fire had passed through them. The trees which are liable to attack are, firs, spruce, and larch (or tamarack, often erroneously called juniper in Maine). Firs are said to be most susceptible and in woods where white, red, and black spruce occur, the white spruce is chiefly affected, and the Norway spruce is said to be specially susceptible. The damage to the trees is most conspicuous about the time when the larva is full grown, that is about the middle of June, in the vicinity of Orono. The caterpillars begin feeding on the young growth in spring. They pupate about the middle of June, and in a week or 10 days the moths emerge and are to be seen on the wing from the middle of June until near the end of July. The eggs hatch in a week or 10 days, and near Orono it was observed that by July 27th nearly all the egg-masses examined were empty. It is said that the larvae feed on the terminal shoots of the branches for a short time before hibernating and that they pass the winter as a very small caterpillar in a little shelter constructed near a bud. Extended search in the vicinity of Orono and other places by the writer and other experienced observers failed to reveal a trace of the young larvae. As it is certain that they do hibernate, their disappearance this season in these localities seemed almost inexplicable. The only reasonable explanation which the author says can be offered is that the small caterpillars were eaten by spiders which were very abundant upon the spruces and which were frequently observed feeding upon them. This pest is controlled naturally by birds, amongst them the purple martin, which was once very common in Maine, but is now decreasing in numbers. Spiders are so active in the destruction of the larvae that the author made special observations on their capacity in

this direction, and was able to satisfy himself that two spiders were quite capable of exterminating several hundred newly hatched larvae which emerged from 12 or more egg-masses upon the branch used for observations. Unfortunately the spiders were lost, but they apparently belonged to the family THERIDIIDAE. The spiders collected from spruce trees on which egg-masses of the bud-moth were abundant were determined by Mr. J. H. Emmerton as *Theridion spirale*, *T. differens*, *Linyphia phrygiana*, and *Dictyna volupis*, and the author is of opinion that the extraordinarily small number of young caterpillars found, in comparison with the very large number of egg-masses, can be explained by the action of these spiders. Of insect parasites, several Hymenoptera have been reared, but only two species of Diptera, *Exorista vulgaris*, Fallén, and a new species of Tachinid, *Winthemia fumiferanae* (described in the Canadian Entomologist, xliv, pp. 2-3). The two species of Hymenoptera which were reared were *Pimpla ontario*, Cresson (Trans. Amer. Ent. Soc., iii, p. 146), and *Pimpla conquisitor*, Say.

Dr. Gordon Hewitt has reared the following parasites of the spruce bud-worm, *Apanteles fumiferanae*, *Meteorus trachynotus*, *Canoblasta fumiferanae*, *Phygadeuon (Diraphanes) plesius*, *Epiurus innominatus*, and *Mesochorus diversicolor*, of which the first four are from the province of Quebec, and the last two from British Columbia. *Nasonia tortricis*, Brues, is another Canadian species parasitic on the spruce bud-worm. The author says that so far as remedial measures are concerned, it would be quite impracticable in timber-lands to do more than aid the spread of the beneficial parasites, but that in limited areas or for the protection of ornamental trees or of young trees in a plantation the use of arsenical sprays would keep the pest under control. This is rendered easier by the fact that the insect is a native and is subject to attack by indigenous parasites, and the author thinks that its past history justifies the hope that it will succumb to its natural enemies within a very few years. Details are given of the results of spraying experiments and their cost. The spray used was arsenate of lead 5 or 6 lb., mixed with 100 gals. of water. The cost per tree sprayed by machinery varied from 30·7 cents to 40·6 cents in the grounds of the station, but those trees which were far away from a water supply and not easy to reach averaged 88 cents. A short bibliography concludes the article.

JOHANNSEN (O. A.). **The Potato Flea Beetle.**—*Maine Agric. Exp. Station, Orono*, Bull. no. 211, March 1913, 4 figs., 1 pl., pp. 37-56.

The author says that next to the Colorado beetle this is the most destructive of the annually recurrent insects on the foliage of the potato in Maine. The insect riddles the leaf with minute holes, and in the case of one unsprayed field in Orono last year the plants were entirely killed before July 10th. The damage actually done by the insect is not however a measure of the full extent of injury to the plant, because it has been observed and is generally acknowledged that fungus disease follows rapidly upon its attack, and it is possible also that the insects assist in carrying

... diseases from plant to plant. Although the adult has long been known, it is only within the last few years that it has been discovered that the larvae live in the ground, feeding on the roots and tubers of the potato and perhaps on related plants. The distribution of the pest is very wide and is mentioned in the publications of more than half the Agricultural Experiment Stations of the United States. The hibernating adults emerge from their hiding-places under leaves and rubbish during April and May in the State of Maine, usually in the latter month, and may be found upon plantain and other weeds as well as upon the foliage of wild cherry, apple, maple, and other trees, on which they apparently feed but little, if at all, for the leaves are not punctured. but early in June, in the vicinity of Orono, when the young tomato plants are set out, the beetles swarm on to them and do great damage. Mating takes place in the last week in June and the first eggs are found about the same time, and none later than the middle of July. In laboratory experiments potato plants were charged with flea-beetles on July 3rd; on July 30th full-grown larvae and a few pupae were found among the roots, the larvae mining in the seed potato. The pupae as well as some of the larvae were found free in the earth among the roots. During August and up to the end of the first week in September larvae and pupae were to be found in the ground among the young tubers, but after that date they had all disappeared. The first frost of September marks the disappearance of the beetles. The author gives a list of host plants and remarks that the insect prefers the members of the natural order Solanaceae, especially the wonder-berry (*S. nigrum*, var.). Experiments were also made in the laboratory with a large number of plants with a view to determining what the insect would and would not eat. Bean, sunflower and lettuce were readily consumed, but the insects refused to eat, amongst others, raspberry, turnip, cabbage, red clover, carrot, and horse-chestnut leaves. With regard to these experiments the author remarks that they must not be regarded as conclusive because the leaves used were in most cases fully grown and that the insect has an obvious preference for very young and tender leaves. No parasites were obtained by the author, although Braconid parasites have been recorded by Forbes and Chittenden. It has frequently been said that the flea-beetle cannot be poisoned and the author, whilst remarking that this of course is not true, says that it is well known that potato fields sprayed in the usual way against the Colorado beetle are not exempt from attack by the flea-beetle, which carefully avoids the poisoned part of the leaf and contrives to obtain what it requires on the underside where there is no poison. He suggests that it is very desirable to devise some poison mixture which would prove attractive to the insect. Experiments were made on a small field at Orono with arsenical sprays sweetened with syrup, but the conditions of the experiments were not very satisfactory, although the author is inclined to the belief that sweetened arsenical sprays would be of some value. Bordeaux mixture is an excellent repellent. The article concludes with a lengthy bibliography and a long list by Miss E. M. Patch of insects recorded on potato.

Truelle (A.). **Peut-on empêcher la ponte des Cécidomyes noires sur les poiriers?** [Is it possible to prevent the Black Cecidomyia from laying eggs on pear trees?]—*La Vie Agricole*, ii, 29th March 1913, pp. 448-449.

The author says that in those districts in which pears are largely grown the ravages of the larvae of *Cecidomyia pirivora* or *nigra* are often very serious. The female lays 15 to 20 eggs in April on the flower-buds just before they open and the larvae as soon as hatched penetrate into the embryo ovary of the pear causing hypertrophy and distortion. The pears lose their proper form and are known to the growers as "calabash pears." Frequently in the beginning of June the hopes of a good harvest are entirely destroyed by the fall of large numbers of these damaged fruits. There are but few methods of control and all have for their object the destruction of the larvae contained in the young pear and the pupae which are wintering in the soil. The first can only be dealt with by collecting and burning all affected fruits, and it is found to be an excellent plan to allow pigs and poultry to run in the orchards. With regard to the pupae in the soil, the author says that the method, practised in the United States, Canada, and England, of spreading kainit over the whole surface of the soil shaded by the trees towards the end of summer, is now in use in France. Quite recently it has been suggested to use a spray made as follows:—10 per cent. nicotine solution 1 litre, methylated spirits (90 per cent.) 1½ litres, soft soap 200 grms., and rain-water to make one hectolitre, the whole to be thoroughly mixed and sprayed over the flowers just after they open. The author points out that, with the exception of the last-named method, these remedies are only applicable after the damage has been done. He further draws attention to the work done by Dr. G. Lüstner, Director of the Station of Vegetable Pathology at Geisenheim on the Rhine, which was prompted by the great damage done by this insect to pear orchards in Germany, with a view to determining whether anything could be done to prevent the insect from laying its eggs upon the flower-buds. The general plan of these experiments was the use of odorous substances and certain poisons sprayed upon the young buds; but Dr. Lüstner arrived at no definite conclusion as to the results, because in the orchard of the experiment station the attack of the fly was very much less than in the previous year and further experiments would be necessary in order to decide as to the utility or otherwise of any of the preparations used. At all events they did no damage to the flowers.

Watson (J. R.). **Melon Aphis.**—*Univ. Florida Agric. Exp. Sta.*, Press Bull. no. 206, 29th March 1913, 2 pp.

This plant louse is commonly called the Melon Aphis, but in Florida is frequently called the Hessian Fly, although entirely different from the true Hessian Fly. It lives on the undersides of the leaves. The outbreak is easily overlooked in the early stages, and the presence of the pest is not noticed until the leaves begin

fail and die to a serious extent. The author says that there are four effective measures for keeping the pest in check:—spraying, fumigation, dusting and clean culture. For the ordinary grower he recommends spraying with soap and a decoction of tobacco, which should be done immediately the first sign of attack appears. He gives the following as a good formula:—Dissolve 1½ lb. of soap in ½ gal. of water, add four-fifths of a pint of "Black Leaf" and 2-3," boil for five minutes and dilute to 5 gals. He says that tobacco extracts on the market vary in strength, but most of them will require to be used in a dilution of about 50 volumes of water in order to kill this aphid, which is more resistant than most others. "Black Leaf 40" is a strong extract of nicotine sulphate, and one part of this in 1800 of the spray will suffice to kill. With the home-made decoction use about one part to five of water, or one gallon in the above formula instead of the "Black Leaf." Kerosene emulsion and whale oil soap are satisfactory remedies against aphids, but for cucurbitaceous plants it is difficult to use it of sufficient strength without causing damage. There is no danger from the use of soap tobacco spray. The author recommends a nozzle of the Vermorel type with an elbow, so that the spray can be effectively applied to the undersides of the leaves. He describes methods of fumigation with prepared tobacco paper, hydrocyanic acid and carbon bisulphide, and recommends large growers to prepare about 10 fumigation frames 1 ft. by 4 ft. by 6 ft. covered with muslin cloth which has been soaked in linseed oil. The cloth should hang below the frame so that earth can be thrown on its edges to make the frame airtight. Dusting with fine tobacco dust is often effective in preventing an outbreak, but it is much less effective than spraying when the pest has made some headway. Clean culture is very important, because the aphids feed on a large number of common weeds and live through the winter on them. The ground on which a cotton crop has been planted should not be laid down to melons the year following. It is suggested that on ground which is intended to be planted with melons or cucumbers, a little rape, kale, or mustard should be grown during the winter as a trap crop. The cabbage aphis is attracted to this, and also many Syrphid flies which destroy them in large numbers.

Korolkov (D. M.). НАСѢКОМЫЯ, ПОВРЕЖДАЮЩІЯ САДЫ [Insects injurious to gardens].—Матеріалы по изученію вредныхъ насѣкомыхъ Московской губерніи [Materials for the study of the injurious insects of the Government of Moscow during the year 1912].—Published by the Zemstvo of the Government of Moscow, 1912-13, pp. 1-25.

The entomological researches which led to the appearance of this report were initiated by the Zemstvo of Moscow in the year 1909, and this is the fourth report of the kind which has been issued.

The following insects are recorded as having done more or less injury to fruit trees in the Government of Moscow during the year 1912:—*Byturus tomentosus*, F., *Incurvaria rubiella*,

Bjerk., *Carpocapsa pomonella*, L., *Nematus ribesii*, Scop. (*centricosus*, Kl.), *Macrophya punctum-album* L., *Malacosoma neustria*, L., *Aporia crataegi*, L., *Hyponomeuta malinellus*, Z., *Leucoma salicis*, L., and *Psylla mali*, Forst. The greater part of this report is devoted to the first-named insect, *Byturus tomentosus*, F. In the spring of the year under report exit of adults of this insect from the soil was considerably delayed in comparison with the preceding year, single specimens having been found here and there on raspberry, as well as on apple, acacia, lilac and service trees, on and about the 24th May, while their appearance *en masse* did not take place till much later. This delay was caused by the lower spring temperature. The insects mostly hibernate in the larval stage, pupating about the middle of April, and the adults normally emerge towards the end of that month. At the time of the budding of the raspberry only the beetles which had wintered in the imago stage came out of the earth and the great mass appeared later, when the raspberry had already opened its buds and produced blossoms, to which the insects could not do so much harm. The laying of eggs was also delayed and when this took place the stamens and styles in the first blossoms had already faded and the ovaries were set, so that the beetles did not lay their eggs in these blossoms and the earlier raspberries were free from larvae, but the later fruit was very badly infested because eggs had been laid on the blossoms by two generations of beetles, *viz.*, those which had wintered as adults and those produced from the larvae in the early spring. The hibernating larvae seldom go deeper than 5-10 cm. in very friable soil, but some of them remain at a depth of only 2-3 cm.

Another unfavourable feature of the year for *B. tomentosus* was the feeble blossoming of cherry and plum trees, which caused the insect to starve for a considerable time. In the opinion of the author it is very likely that this scarcity of blossoms caused the beetle this year to visit plants on which it has seldom or never been observed previously, such as, *Syringa vulgaris*, L., *Ribes rubrum*, L., *R. grossularia*, L., *Amelanchier vulgaris*, Mnch., and *Taraxacum officinale*, Wigg.

The author describes experiments with different insecticides which he carried out in order to discover their effect on the larvae and adults of *B. tomentosus*, as well as on the roots of the raspberry bushes. The insecticides used were creoline, carbolineum ("shachta"), carbolic acid emulsion, oil (naphtha, black residue) emulsion, and carbon bisulphide, which, mixed with water, were poured on to the soil under different raspberry bushes. Artificial manures, such as superphosphate, potash salts, etc., were also distributed over the soil under the bushes in order to test their effect as insecticides. The results of all these experiments are summarised as follows:—(1) The autumn experiments were less effective, probably because the cold weather had considerably diminished all the life-processes of the larva and imago; (2) the manures did not affect in any way the vitality of the insects; (3) oil emulsions had also no effect; (4) a 2 per cent. carbolic emulsion partially destroyed the insects, when applied in quan-

... of 0·7 gal. under each bush; (5) carbon bisulphide, which was injected into the earth by means of Platz's injector, had a very slight effect and only when injected at short distances from the bushes; (6) the best results were obtained by carbolineum and creoline when used in a 2 per cent. solution and in a quantity sufficient to penetrate to a depth of 4·7 inches; weaker solutions had less effect, while a 3 per cent. solution killed all the insects it reached.

The author also describes experiments for controlling the beetle during the period when it attacks the raspberry blossoms, by sprinkling on them a solution of Paris green in ammonia and of a foul-smelling preparation of calcic sulphide recommended by E. I. Zlobin (the composition of which is shortly to be published). The first solution burns the leaves of the plants; while the second undoubtedly keeps away the beetle so long as the smell lasts and does not in any way injure the plants, but repeated sprinklings are necessary.

In the author's opinion the great bulk of the *B. tomentosus* are developed from larvae which found their way to the bushes from the unpicked fruits. A great number of larvae get back to the earth from the picked fruits, when these are left in baskets in the plots of the peasants over-night. As the result of the above observations he recommends, as the best means of fighting this insect, the timely picking of the ripe raspberries, whether good or damaged, and the destruction of the larvae which escape from the picked fruits in the baskets. Such a method would be very effective and can be better afforded by the peasants than the use of different insecticides, which are relatively very costly, and the nature and effect of which has not yet been fully investigated.

*Incurvaria rubiella*, Bjerk. This insect has done more damage this year than in 1911 and especially in the gardens of the village of Zaritzin. The larvae emerge from the earth in which they have passed the winter as soon as the weather begins to be warm (on the 14th May of the year under report) and penetrate into the buds of the raspberries. In most cases these buds never open their leaves, and usually it is the best buds which are damaged. The author never found in one bud more than one larva. In the first period the larvae feed on the buds and do not penetrate into the woody tissue of the stem. It is therefore very easy to pick off the buds with worm-holes and destroy them. The larvae grow very quickly and attain their full development in about a week. They then eat through the buds and pass into the stem; so that at this time by removing an attacked bud it is no longer possible to remove the larva with it, as only the hinder part of the body projects from the stem. The period of pupation in 1912 was from the 2nd to 7th June, and flight took place in the middle of June, the time of blossoming of the raspberry. While the larvae are still in the earth it is possible to eradicate them with carbolic washes or a solution of carbolineum. The author does not possess direct evidence of the death of the larvae from these insecticides, but some experiments showed that there were no larvae of this insect on raspberry bushes around

which the insecticides had been used, although the neighbouring bushes had many damaged buds with larvae in them.

*Carpocapsa pomonella,* L.—The caterpillars of this insect have been found in several localities in the province in the apples, on the trees and also in the fallen fruits. The larvae mature from the beginning to the end of August, after which they usually leave the fruit. The author recommends this as the best time for capturing these insects by means of sticky bands of straw, hay or rags. He describes his experiments with folded belts which had been put on a tree on the 26th August and removed on the 10th November. From one belt the author took 37 larvae of *C. pomonella,* which had made for themselves cocoons of fragments of paper in which they would have passed the winter; 11 specimens of *Coccinella bipunctata,* which are useful insects, so that the burning of the belts would cause some loss in this respect; and about 12 specimens of *Anthonomus pomorum.*

*Nematus ribesii,* Scop. (*ventricosus,* Klug).—The larvae of this saw-fly did considerable injury to the red currant bushes in the village of Chocklowka, but the neighbouring black currant bushes were not touched by them. The larvae differ very much in the rate of their development. The pupation of the first generation took place from the end of June to the middle of July on the surface of the earth, generally near the stems of the currant bushes.

*Macrophya punctum-album,* L.—The larvae of this insect did considerable damage to the ash trees in Moscow, in the Alexander Garden (near the Kremlin), the leaves being skeletonised. Their numbers were enormous, so that the trunks of the trees appeared quite green from the descending larvae. The authorities ordered them to be swept into heaps and destroyed; but although the majority of them were killed in this way and quantities died from starvation, a large number got safely into the earth and pupated in the second half of June, in which stage they wintered. The author recommends that next year the appearance of the insect should be watched for and that it should be attacked by poisoning the food of the young larvae.

*Malacosoma neustria,* L.—This voracious insect has been noticed during the last two years on the poplar trees of Moscow and its environs. Numbers of the eggs were parasitised by *Telenomus terebrans,* Ratz. The larvae have also been found on apple trees and raspberry bushes and on various other trees in the woods round Moscow. In the opinion of the author the harm done by this insect to the fruit trees is not important, because of the destruction of its eggs by the parasite.

*Aporia crataegi,* L.—The caterpillars of this species pass the winter in small nests, consisting of dried leaves drawn together by a web. Such nests are found during the winter and early spring on apple trees and also on cherry trees; they should be collected and burnt. The caterpillars emerge from the nests in the first half (1911) or the latter half (1912) of May. They grow very quickly and during their period of growth destroy a great number of leaves. The author also found these caterpillars on the leaves of sorb apples. Many caterpillars were found to have been infested by a parasite, *Apanteles glomeratus,* L.

*Hyponomeuta malinellus*, Z., was found in quantity during the summer of 1912 on apple trees near Moscow. The injury to the trees was noticed chiefly in the second half of June, although the number of the insects was less than in the previous year.

*Leucoma salicis*, L.—The injury caused by this insect was considerably less during the year under report than previously, chiefly because of the development of its parasites. In November 1911 some of the sticky belts on the poplars had been taken down, underneath which the larvae of this insect had spun small webs; being thus exposed to the cold they soon perished. On an average, 1,000 larvae were found under each belt. Under the belts left till the spring large numbers of dead larvae were also found.

*Psylla mali*, Först.—The author describes the result of experiments on spraying the larvae of this insect with a solution of about 1 lb. of soft soap in 3 gallons of water. Owing to the fact that the spraying took place at a time when the larvae had already entered the opening buds of the apple trees the insecticide did not reach them all, but was otherwise very effective. This insecticide caused some burning of the young leaves, but these recovered later and were merely slightly deformed.

A. D. Baranow states that the egg-stage lasts through the winter and that the eggs hatch out in the end of April or middle of May; the yellowish larvae then penetrate into the buds causing them to shrink and wither. The adults appear at the end of May. Pairing takes place in June, and in August eggs are laid in the folds of the young shoots. These eggs are of an orange colour and are so small as to be hardly noticeable. As insecticides against this insect the author recommends:—(1) a solution of ¾ lb. of soft soap, 1 lb. methylated alcohol, ¼ lb. of tobacco extract and 3 gals. of water; and (2) a decoction of quassia with soft soap:—Boil 3 lb. of quassia chips in water for two hours and strain, make up to 22 gallons with water and add 1½ lb. of soft soap. The author has tried spraying the eggs with a mixture of 1 lb. of green copperas, 2 lb. of rye flour and about 3 gallons of water. The rye flour is boiled in water, the copperas dissolved separately and then mixed. After two sprayings with this solution the eggs turned black and were killed.

Baranow cites the following notes by V. F. Boldirew on *Anthocoris nemorum*, L.:—On the 1st May 1911, when the temperature was 17° R.-18° R. (41° F.) a small pitch-black bug was observed wandering about among the heaps of eggs of *Psylla mali* on the bark of an apple-tree, stopping here and there on a heap. The insect carefully felt the eggs with its proboscis and antennae till it found a fresh full egg, of which it them proceeded to suck out the contents. One insect was observed to suck out the contents of 4 eggs in 4 to 5 minutes. Four similar insects taken at the same time were determined by V. F. Oshanin as being *Anthocoris nemorum*, L.

[In the original the dates are given in Old Style, but they have been converted in the abstract.—Ed.]

**Leftejew (V. A.). НАСѢКОМЫЯ, ПОВРЕЖДАЮЩІЯ ОГОРОДЫ** [Insects injurious to kitchen gardens].—Матеріалы по изученію вредныхъ насѣкомыхъ Московской губерніи. [Materials for the study of the injurious insects of the Government of Moscow during the year 1912].—Published by the Zemstvo of the Government of Moscow, 1912 13, pp. 27–82.

This report deals almost exclusively with *Phyllotreta nemorum*, L., a flea-beetle which does great damage to many Cruciferous plants of economic importance. The author describes all the species of the genus *Phyllotreta* which he found on cultivated plants in kitchen gardens, viz., *P. nemorum*, L., *P. sinuata*, Steph., *P. aterrima*, Schr. (*atra*, F.), *P. undulata*, Kutsch., *P. armoraciae*, Koch, *P. cruciferae*, Goeze, and *Haltica oleracea*. Of all these insects only the first three occur in any considerable numbers and cause practically all the injury. The other species are not so numerous and sometimes only isolated individuals are to be found. With regard to *Haltica oleracea*, the author disputes the statement that this insect is injurious to cabbage, and in his opinion (and in this he is supported by A. A. Silantjew) the supposition has arisen out of the confusion of this insect with a leaf-eating species of the genus *Phaedon*. He has never seen the larva of *H. oleracea* on cultivated Cruciferae, although individual adults were not infrequently found.

The author has investigated the biology of *P. nemorum* and does not agree with those observers who state that the hibernating place of this insect is in the cabbage-stalks which are left standing. He examined 40 stalks of *Brassica oleracea* and found on them a quantity of small Thysanura, two specimens of *Baris chloris*, four specimens of *Longitarsus*, some dipterous larvae and only one specimen of *P. sinuata*. He also investigated, early in March, samples of soil taken from underneath the stalks and in other parts of the garden and found only single individuals of *Phyllotreta*. Examination of the hot-beds gave the same results and, allowing that the wintering of these insects may take place to some extent in the earth, he found that this could not be the case with the majority. At the end of his investigations, in August, the author came to the conclusion, confirmed by facts, that they pass the winter under the cover of the Cruciferous weeds on which they pass their last period of summer life. These plants, lying on the earth after withering, form a warm cover for the hibernating insects.

The author noticed the first beetles in the hot-beds on the 24th April, after which date their number gradually increased and on the 2nd May the damage done by them to the plants could be clearly observed. Outside the hot-beds he found the first specimens of *P. nemorum* on the 6th May, on *Thaspium arvense*. On the 9th May they had devoured quantities of Cruciferous weeds as well as the cabbage seedlings in the beds. Further investigations led the author to divide the whole summer life of the insects into three cycles as follows:—(1) Leaving their wintering places as soon as the earth thaws and the first green appear

in the gardens, *P. nemorum* being in great need of food immediately attacks and feeds on the Cruciferous weeds which are the only ones to be found at this time of year. They eat the leaves, their petioles, the stalks and the blossoms. The plants attacked at this period are *Thaspium arvense, Capsella bursa pastoris, Bunias orientalis,* and *Draba verna*. This brings the author to the question of the possible use of trap seedlings, by which is understood the sowing of certain plants on special plots in the gardens before the actual appearance of the insects, so that at the time of their appearance they should find no other food and be compelled to concentrate on these plants; an opportunity would be thus afforded for collecting and destroying them. The author describes experiments made to this end, and in his opinion this method of fighting the pest must be conducted very carefully and requires a full knowledge of the bionomics of the particular insect, as otherwise should the exact time for capturing the pest be missed, the seedlings will only have served the purpose of helping its growth, with the result that in a few days it will pass over to the cultivated plants. (2) When the leaves of the Cruciferous weeds have become more coarse the insects leave these plants and go over to the cultivated Cruciferae which have just then come out and afford them more tender food. The insects eat the leaves (the author seldom noticed damage to the petioles), devouring first the thin epidermis, then gnawing through the leaf and afterwards gnawing round the edges of the hole so formed. (3) In August, when the leaves of the cultivated plants, especially of the cabbage, get more coarse and cannot be easily gnawed by the insects, they return again to the weed Cruciferae, which at this time have again put out fresh leaves, and on these they remain till the end of their summer life, afterwards passing the winter underneath the withered remains of these plants. Besides the plants mentioned above, *P. nemorum* was found more or less frequently at a later period on the following, all of which belong to the family Cruciferae:—*Laphanus sativum, Camalina dentata, Erysimum charanthoides, Barbarea vulgaris, Brassica campestris, B. oleifera, B. rapifera, B. esculenta,* and *Bunias orientalis*. Investigations on the time the insects can live without any food whatever proved that under normal conditions of temperature and moisture they cannot live longer than about 10 days. Shut up in a glass vessel without earth they began to die on the 3rd day, and in 7 days practically all were dead.

The author describes fully his experiments to determine the amount of food consumed daily by each insect, which was estimated at 14 to 15 sq. mm. of a cabbage leaf. Although this may seem a very small amount, the number of insects attacking each plant has to be taken into consideration. According to observations made by the author near the village of Zaritzin, where the insects destroyed the whole of the cabbage seedlings in one day, no less than 73 to 174 beetles occurred on each plant. They are most active on bright, sunny days, whereas in rainy weather they often leave the plants entirely. They begin feeding in the morning after the dew has gone, at first very slowly, and they do not then jump; the greatest activity in eating and jumping is

displayed between the hours 11 to 1 p.m. and 4 to 5 p.m.; after 7 p.m. they move very little.

The first eggs were laid on 7th June, on the leaves of radish, and from this date the number of eggs found increased daily, it being estimated that *P. nemorum* requires more than a month to produce a complete generation. The eggs are laid in heaps of several dozens each; the author once found in one heap 107 eggs, but he is unable to say whether all these eggs were laid by one or by several insects. The heaps usually appear at the connections of the lateral with the central vein of the leaf; on the leaves of radish, which are covered by small hairs, the eggs are laid between the veins. After 7 to 8 days the larvae emerge, but a very considerable number of eggs appear to perish without hatching. The author counted on some leaves as many as 700-900 eggs, but never found more than 107 larvae on any one leaf, and he was unable to discover the cause of the failure of the eggs to hatch out. The majority of the larvae appeared on the plants between the 26th and 28th June. The insects were observed on the plants in all stages from egg to imago at the same time, and the last eggs were seen on the 18th July. The larva eats into the leaves and forms small burrows in the parenchyma. The veins of the leaves are seldom gnawed through, the larva going usually round them. Larvae were rarely found on the petioles. Under some conditions the larvae pass from one plant to another. Pupation takes place chiefly on the leaves or in the earth, if the larvae drop from the leaves. In some cases the author noticed pupae on the leaf petioles. The larval stage lasts from 12 to 16 days, the pupal 8 to 9 days, so that the whole period of transformation takes place in about 31 days.

Reasons are given for supposing, contrary to the usual statements, that *P. nemorum*, and perhaps also *P. sinuata*, produces a second generation in the year. In order to determine the time of the death of the hibernated insects, the author kept, during the whole summer, two beds of cabbage in which he replaced the plants as fast as they were eaten by the beetles, without interfering with the latter. Under these conditions the hibernated insects began to die about the 23rd of July, and practically all were dead by the middle of August.

The author recommends the destruction of the Cruciferous weeds as being one of the best methods of fighting *P. nemorum*. This will leave the insects after the winter without food for a few weeks and the great majority of them will perish. The best and easiest way of attacking them in the hot-beds is stated to be fumigation with tobacco-smoke. Outside the hot-beds the methods recommended are divided into measures for destroying the insect and preventive methods.

The best insecticide is Schweinfurt green, the following recipes being given:—For young seedlings: 50 grms. of Schweinfurt green (no. 707), 50 grms. of caustic lime, 100 litres of water, and 1 lb. of rye flour; or, 150 grms. of Schweinfurt green, 350 grms. of caustic lime, 125 litres of water, and 800 grms of rye flour. For older plants (more than 3-4 weeks): 200 grms. of barium chloride, 12 litres of water, and 1 glass of black molasses.

The author recommends the use of an entomological net, with which, he says, it is possible to catch great numbers of insects; he quotes a statement by J. F. Schreiner, who caught in this way 4,000 insects in 5 minutes. Another appliance mentioned is a racquet covered with some sticky substance and having a handle about 7 feet long. The strewing of hay on the gardens in the autumn, before the insects retire to their place of wintering, is also said to be a useful trap. The cover thus formed attracts them and they may be destroyed by setting fire to the hay. The author also recommends strewing horse-dung over the beds, the ammonia which is given off being said to kill or keep away the insects.

Amongst preventive measures the author gives:—(1) smoke; (2) sand or gravel spread between the plants [the reason why the insects avoid this is not sufficiently explained and is apparently unknown]; (3) sprinkling the plants with an infusion of wormwood; (4) basic slag; (5) sprinkling the plants with manure water; and (6) petroleum, which is best applied by scattering earth impregnated with petroleum over the beds; the author describes his own experiments with this method, which gave excellent results.

The author adds the following note on *Anthonomus pomorum*, L. Starting his investigations on the 15th April, he found three weevils under the rough bark of old apple trees. The warm weather of the 16th to 19th April brought out the insects from their winter homes, and on the following day the author syringed some trees with a solution of lime. A few days later it was necessary to repeat the syringing as the solution had been washed off by rain, and this again rendered a third syringing necessary. The number of *A. pomorum* found on the trees increased daily and on the 1st May the first pairing was observed. On the 2nd it was decided to shake the trees and the results showed that the trees treated with lime contained none or only single specimens of the insect, whereas the other trees yielded dozens of them. The author considers this season to be the most suitable for attacking the pest, as it is at this time that it lays its eggs. Further experiments confirmed the good effect of lime. The lime does no injury to the trees, but on the contrary is beneficial. The author also describes experiments as to the time these insects can live without food, and comes to the conclusion that it is from 5 to 11 days, depending upon the temperature and moisture. The higher the temperature and the drier the air, the more quickly they perish.

BARANOV (A. D.). ПОЛЕВЫЕ ВРЕДИТЕЛИ [Field pests].—Матеріалы по изученію вредныхъ насѣкомыхъ Московской губерніи. [Materials for the study of the injurious insects of the Government of Moscow during the year 1912].—Published by the Zemstvo of the Government of Moscow, 1912 13, pp. 83-101.

The following injurious insects have been noticed in the fields in 1912. *Oscinis frit*, L., *Mayetiola (Cecidomyia) destructor*, Say, *Euxoa (Agrotis) segetum*, Schiff., *Phyllotreta vittula*, Redt.,

*Ochsenheimeria taurella*, Schiff., *Hylemyia coarctata*, Fall., *Sitones lineatus* L., *Apion apricans*, Hbst., *Phytonomus* sp., *Anthothrips aculeata*, *Agriotes lineatus*, L., and *Siphonophora cerealis*, Kalt.

*Oscinis frit*, L.—This insect winters, in the Government of Moscow, in both the larval and pupal stages, the proportion being 10-15 pupae to 100 larvae. The first spring brood of the flies emerged about the 2nd June, and on the 5th June the author noticed them pairing on the summer-sown barley, wheat, and oats, oviposition taking place 1-2 days after pairing. The author discovered the first eggs on the 8th June, from which date their number steadily increased, reaching its maximum between the 11th May and 15th June. The eggs are laid on different parts of the plant, but mostly on the upper side of the leaf, near the stalk, between and parallel with the veins of the leaf. After the larva emerges the shell of the egg is mostly found at the point of entrance of the larva into the plant, so that evidently it carries the shell with it. The development of the egg takes 4 days (Wildham puts it at 2-5 days, and Rerig 3-7 days), the first larvae having been observed on 12th June. The larval stage occupies 14-15 days, and pupation takes place near the roots of the plants, sometimes even at a depth of 1-2 inches in the earth. The first pupae were noticed on the 27th June, at which time the author found all stages of the insect, imago, eggs, larvae, and pupae on the summer-sown grain. The pupal stage lasts 10-12 days, and the second brood began to emerge on 7th July, continuing to do so for nearly a month. The author was unable to observe the flight of the third brood in the field, as there were at that time two generations of flies still about, but experiments conducted partly on a special plot covered with muslin, and partly in the laboratory, led him to assume that the flight of the third brood begins on the 25th August and that the descendants of this generation hibernate as pupae. From about 15 per cent. of the pupae of *Oscinis frit* the author obtained the parasites, *Rhoptromeris wildhami*, Kour., and *Trichomanus cristatus*, Foerster.

*Phyllotreta vittula*, Redt.—This beetle becomes yearly more numerous and the damage done by it to the summer-sown crops is increasing. The author never found it or noticed any damage done by it on the winter-sown crops. It winters in the province of Moscow in the imago stage among the roots of summer stubble and of *Triticum repens*. It emerges from the earth with the return of warm weather (the middle of May in 1912) and immediately attacks the sprouting grain. It does the most injury at the time of pairing, and at the beginning of June its injurious activity decreases. It feeds on the epidermis and parenchyma of the leaves, forming channels in them parallel with the veins. If the number of channels is not great the leaves may recover. The author did not succeed in finding eggs of this insect. The harm done to the plants by the larvae was considerably greater than that done by the adults, and the author noticed that the former sometimes pass over to another plant. The plants attacked by the larvae generally die or are greatly retarded in

their development. After the 15th June the insects decreased in numbers and by the beginning of July there remained only single individuals, but they reappeared on the 15th August in great numbers. As a remedy against this insect the author recommends: (1) The destroying of *Triticum repens* in the fields and hedges and along roads, as these plants help the initial development of the insect; and (2) the sprinkling of the sprouting summer-sown corn and of *Triticum repens* with Schweinfurt green, taking for 55 gallons of water 1 lb. of green and 3 lb. of caustic lime.

*Euxoa segetum*, Schiff.—This insect has done considerable damage to the winter sowings in the districts of Voloklam, Klin, and Dmitrow, in the Government of Moscow. During 1912 the author searched for the caterpillars and pupae by digging in the fields, but neither in the spring nor in June did he succeed in finding any, and it was only in August that he discovered two caterpillars. He found no traces of the insect in the winter field of the village Orudjevo, in Dmitrow district, but in a field at Ocheevo, only 3 versts (just under 2 miles) away, this beetle had totally destroyed one section and more than half of each of two adjoining sections, while in the remainder of the field there appeared isolated bare places. The field was re-sown from 19th-23rd August. Bare spots on the recently sown land were noticed by the peasants on the 2nd September and by the 8th September one section was completely destroyed. The greatest amount of injury was done between 3rd and 7th September. When the author reached this field, after the 8th September, the insect had already stopped feeding and disappeared into the earth to a depth of about 7 inches, the soil being very sandy, friable, and deeply ploughed. As a result of observations and enquiries the author recommends keeping the fields under bare fallow, leaving only a few patches of weeds. In these the insects will no doubt lay their eggs, and it will then be possible to destroy them by means of Schweinfurt green and barium chloride. According to the investigations of another author, Mr. N. S. Jachontow, the imago of *Euxoa segetum* flies in the month of June, when it should be possible to catch it by the use of molasses.

Control by the use of molasses is, the author says, cheaper than any other method and is exceedingly simple, but unfortunately he does not explain the mode of operation. The head of the Entomological Station of Tula states, the cost of application for 100 dessiatines (about 270 acres) to be as follows:—

| | *s.* | *d.* |
|---|---|---|
| Horse work ... ... ... ... ... | 1 | 7 |
| 20 wooden troughs ... ... ... ... | 10 | 7 |
| Wages of 1 day labourer ... ... ... | 0 | 10 |
| 5 pud (82 kilos) of molasses ... ... ... | 2 | 2 |
| Yeast ... ... ... ... ... ... | 0 | 2 |
| Total ... ... ... ... | 15 | 4 |

*By the use of the molasses method on a large estate in K[illegible], in 1907, 98,414 moths of the first brood were captured in May and June and, in July and August, 46,710 of the second brood.* When it is considered that each female represents a possible [illegible] larvae, the amount of destruction prevented by these captures was very great.

*Ochsenheimeria taurella*, Schiff. This insect is very widely spread in the winter-sown fields of the province, especially in the districts of Zvenigorodsk and Bronnitzk, where it has caused great injury. The author noticed some winter rye with two holes near the root, but in these plants he never found the larvae, whereas he obtained them from plants with only one hole near the root; which leads him to assume that the larvae are able to pass from one plant to another. At the beginning of July he found the pupae usually between the leaves and the stalks.

*Mayetiola (Cecidomyia) destructor*, Say.—This insect has not as yet invaded the province to any extent. The author did not find any damaged plants or any pupae in the fields examined, but in the grounds of the Agricultural Institute he found in the month of April 93 pupae. The plots in this field had been sown in May of 1911 with winter wheat, which remained standing for the whole of summer and autumn. The pupae were taken to the laboratory and the first flies emerged on the 13th May and the last on 31st May, with the maximum on the 24th. After the 1st June parasites emerged from the pupae, all of which proved to be *Polygnotus minutus*, Lind. The proportion of pupae parasitised was approximately 15 per cent.; there being 5-8 larvae in each of the infested pupae.

*Agriotes lineatus*, L. This insect appeared in certain fields about the end of May and in some places it had done considerable damage to the summer-sown oats and to clover. It was found about 2 inches under the soil eating away the neck of the roots. In the autumn it appeared again in great numbers in several winter-sown fields. In one field, near the station of Nemtchinov on the Alexandrow Railway, it totally destroyed half a field, in which the soil was very soft and friable in consequence of deep ploughing and abundant manuring; whereas the other half of the field, where the soil was harder, was free from the insect. As a remedy the author recommends baits of potatoes and linseed cake, poisoned with white arsenic and Schweinfurt green, to be put in the earth between the seeds at a depth of about $1\frac{1}{2}$-2 inches.

*Apion apricans*, Herbst.—This insect appeared in the clover fields in the spring. The pairing was observed at the beginning of May and soon afterwards plants were to be found with their leaves perforated. On and after 8th June eggs of *A. apricans* were observed on the blossoms of clover and the larvae on the 12th June. On some heads of bloom as many as 40-50 larvae were found. Pupae were noticed on the 26th May, from which the beetles emerged on the 2nd June. With the larvae of this insect were also found those of *Phytonomus sp.* The latter is three times the size of the former. These larvae pupated on the 28th June, and the beetles emerged on the 5th July.

POUILLAUDE (I.). **Quelques Tysanoptères nuisibles.** [Some injurious Thysanoptera.]—*Insecta, Rennes,* April 1913, pp. 139-145, 5 figs.

This paper is a résumé of the habits and occurrence of the more important injurious Thrips. The author says that they are, in practice, very resistant to the action of insecticides in consequence of their great numbers, but that in enclosed spaces, such as greenhouses, it is not difficult to get rid of them. He recommends tobacco fumigation, the use of nicotine in solution, and hydrocyanic acid fumigation. In the open, a 1½ per cent. solution of nicotine, with 1¼ per cent. of soft soap, is recommended, or a similar strength of soft soap with 2½ per cent. of flowers of sulphur in place of the nicotine. Spraying with these mixtures should be done preferably in the evening or in the early morning and is useful for shrubs and kitchen garden plants. In the case of field crops, all that can be done is to destroy all rubbish and waste material around them and to change the crops frequently; in the case of cereals the sowing of early-ripening varieties of grain is recommended, so that when the thrips arrive they may not have the opportunity of doing so much damage. The article concludes with a brief bibliography.

HOLMAN-HUNT (C. B.). **Notes on Insect Pests in the Federated Malay States.**—*Agric. Bull. Fed. Malay States,* i, April 1913, pp. 327-328.

The locust, *Pachytylus danicus*, has been reported from many places in Selangor, Negri Sembilan and Malacca. A Hispid beetle recently reported as attacking coconuts near Singapore has now been found on young plants from Kuala Selangor and a Lepidopteron, *Hidari irava*, has also done considerable damage, but the larvae are parasitised to a very large extent by an Ichneumon. A large white cockchafer or May-beetle, allied to *Lachnolepis lactea*, has been reported from Kedah as doing damage in the grub stage to roots of rubber seedlings. This grub usually feeds on roots of grasses and probably some of these have been left in the soil and the rubber roots only attacked by accident.

MASKEW (F.). **Sweet Potato Weevil** (*Cylas formicarius*).—*Mthly. Bull. State Comm. Hort., Sacramento, California,* ii, pt. 5, May 1913, pp. 535-537, 2 figs.

This pest was found by the Inspectors at San Francisco in a shipment of sweet potatoes from China, and the author has no doubt that this is by no means the first time that it has arrived in the United States. Superficially there is very little to show that the potato has been attacked, beyond the minute hole through which the larva has entered, and the full extent of the ravages can only be seen when the potato is cut open. *Cylas formicarius* is a very widely distributed species and probably a native of Cochin

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China. It has also been reported from the Southern United States, Hawaii, West Indies, Northern Australia, India, and Madagascar [and many localities in Africa], but so far not from the sweet potato fields or markets of California. The author quotes Van Dine's description and says that he has no suggestion to offer as to methods of controlling its ravages in the field, or in the store-room, the special function of his department being to prevent its entry into the country.

WILSIE (W. E.). **The Date Palm Scales and their Control.**—*Mthly. Bull. State Comm. Hort., Sacramento, California*, ii, pt. 5, May 1913, pp. 538-539.

The author says that it is not generally known that with the introduction of the edible date into California, there were also introduced two date scales, *Parlatoria blanchardii* (Targ.) and *Phoenicococcus marlatti* (Ckll.). The amount of damage is still a matter of conjecture, but the longer it is studied the more serious it appears to be. No natural enemies have been found and artificial means of control are the only ones available. In the case of the first-named pest, after the San Francisco fire it was discovered that ornamental palms withstood the great heat and put out new leaves at once after the fire. The burning remedy was then tried on the Tempe garden in Arizona with success, and later many trees were entirely cleaned by this treatment, the method being to defoliate the tree completely to the stump, which is burned over with a gasoline torch. The second pest has been more persistent than the other, for the reason that it works behind and on the base of the leaves out of sight and out of the light. Little is known of its life-history, but it unfortunately attacks the vital parts of the plant, sucking the tender new growth at the base of the leaf. The fruit-stalks, which when young are exceedingly tender and brittle, and when fully grown have to carry the nourishment required for a possible 75 lb. weight of fruit, are sometimes entirely covered by this scale. Various remedies have been tried, many of which resulted in great injury to, or the death of the plant. The first remedy which has given any hope was a special preparation made by a Mr. C. W. Taylor for mealy bug, and this has proved exceedingly successful against both scale-insects. The trees are now treated by spraying during the pollinating season and the solution is sprayed in large quantities on the fruit just forming, without bad results. Young plants have been dipped with success, but care must be taken that no air-bubbles are present on the leaves, for if but a few scales escape the pest very soon spreads and the work must be done over again.

WATSON (J. R.). **Melon Worm and Pickle Worm.**—*Univ. Florida Agric. Expt. Sta.*, Press Bull. no. 209, 3rd May 1913. 2 pp.

These insects are reported to have done much damage in Florida in the last season and to be again active. In spite of their common names, either or both of them may be found on cucumbers

cantaloupes, as well as on gourds and squashes. They seldom attack water-melons. Their habits differ somewhat, as do the remedies to be applied. The pickle worm is the more common. It never eats leaves, but bores into buds, blossoms, stems, and leaf-stalks, as well as into the fruits, which it utterly ruins. The melon worm confines itself more or less to the fruits and leaves, and can be reached by arsenical sprays; the author gives the following formulae as useful:—(*a*) lead arsenate paste 3 lb.; (*b*) lead arsenate powder 1½ lb.; or (*c*) zinc arsenite 1 lb.: each to be mixed with 50 gals of water; (*d*) Paris green ⅓ lb., fresh slaked lime 1 lb., and water 50 gals. The last is said not to stick so well as the others and to be more liable to burn the foliage. The pickle worm can only be dealt with by the careful collection and destruction of all wormy fruit. The moth will lay eggs sufficient to produce about 300 larvae, so that the destruction of infested material is very important. The author says that the easiest and most successful remedy for both worms is a trap crop, and for this purpose advises that on every acre of cucumbers or cantaloupes 4 to 8 rows of early summer or crook-necked squash should be planted. The moths prefer these to either cucumbers or melons and most of the eggs will be laid on the squash. It is well to make several plantings of the latter so as to have a succession of attractive blossoms and fruits to invite the moths. The first should be planted with the cucumbers or melons and the others at intervals of a week. The infested blossoms and fruit should be diligently picked off and destroyed, and even a simpler way is to pull up and burn each lot of trap plants as soon as they have become thoroughly infested, and before the worms have attained their full size. Cucumbers and melons should not be planted on the same land two years in succession. The pickle worm (*Diaphania nitidalis*) is a whitish caterpillar with conspicuous black dots on each segment; when nearly full grown the worm becomes of a coppery colour. The melon worm (*Diaphania hyalinata*) has no dots but has longitudinal stripes and never becomes copper-coloured. The growth is completed in about 2 weeks. A cocoon is formed in a dry leaf on or near the plant and about a week afterwards the moth emerges. The pickle worm moth lays its eggs mostly on the buds and on the flowers, whilst the melon worm moth deposits them chiefly on the tender young leaves, the eggs of both hatching in about 3 or 4 days.

[illegible]EST (S.). **Spraying for** *Chrysomphalus dictyospermi.*—*Rivista di Agricoltura, Parma,* xix, no. 22, 30th May 1913, p. 349.

The author says that this Coccid can be effectually kept down by spraying orange and other trees with either of the following mixtures:—(*a*) sulphur 5½ lb., quicklime 9 lb., water 22 gallons; (*b*) sulphur 6½ lb., quicklime 6½ lb., water 22 gallons. The lime is to be put into a vessel and 2 to 3 gallons of boiling water poured slowly on to it, then the sulphur is added and then more gallons of boiling water. The mixture is violently stirred

for several minutes and then the remainder of the water added with constant stirring. These mixtures should be used frequently, and also during the winter. One spraying in winter and two or three more during the course of growth will free the trees not only from Coccids, but also from other parasites.

MOREAU & VINET. **Sur les effets comparés de l'arsenic et du plomb dans les traitements appliqués contre les larves de Cochylis.** [On the relative effects of arsenic and of lead upon the larvae of Cochylis.]—*C. R. Acad. Sci., Paris*, clvi, no. 11, 17 March 1913, pp. 906-908.

The authors have determined that the larvae of Cochylis (*Cl. ambiguella*) which escape direct poisoning by arsenate of lead are small, badly developed, and of feeble destructive power, whereas those which escape or resist other methods of treatment are not affected in this way. Experiments were made to determine whether this enfeeblement of the larva was due to the arsenic or to the lead. For this purpose they used arsenate of zinc or of lime and acetate or carbonate of lead. The result showed that the enfeeblement was due to the arsenic. Considering however that the combination of the arsenic with other metals might be of importance, further experiments were made with arsenates of copper and of iron. The first-named acted in much the same way as arsenate of lead, but the insecticidal action of the latter was very feeble. The authors therefore conclude that sprays with a basis of arsenate of lead are the best of the arsenical mixtures.

VAN DER LAAT (J. E.). **La apicultura en los jardines escolares.** [Bee-keeping in school-gardens.]—*Boletin de Fomento, San José, Costa Rica*, iii, no. 1, 1913, pp. 44-50, 5 figs.

Apiculture has been greatly neglected in Costa Rica, and this paper makes a strong plea for its establishment in the school curriculum, not merely on account of its educational value, but because of its economic importance in increasing the yield of coffee, cacao, and fruit plantations, apart from the profits from honey and wax.

**El cultivo del ajo.** [The cultivation of garlic.]—*Boletin de Fomento, San José, Costa Rica*, iii, no. 2, 1913, pp. 130-133.

As in most countries inhabited by Latin races garlic (*Allium sativum*) is cultivated fairly extensively in Costa Rica. Among its enemies are the "white worm" (el gusano blanco) and some Curculionids (pulgones) which may be destroyed effectively by making holes in the soil with a pointed stick, and applying carbon bi-sulphide or vaporite.

K... (A.). **Über die Beschädigung der Korkeiche durch** *Cremastogaster scutellaris*, **Ol.** [*Cremastogaster scutellaris* damaging the cork-oak.]—*Archiv für Naturgeschichte*, lxxix, A., no. 1, 1913, pp. 56-58, 2 pl.

Almost all the cork-oaks in the district of Sorgono, Sardinia, were found to be severely damaged by the red-headed ant, *Cremastogaster scutellaris*. Fortunately, however, the latter prefers the ... layer of cork, of a very inferior quality, and does not damage the tree physiologically. The burrows, which differ from those made by a local species of *Camponotus*, are shown in two excellent photographs.

P...ARD (F.). **Sur la biologie du** *Cacoecia costana* **et de son parasite** *Nemorilla varia*. [On the biology of *Cacoecia costana* and its parasite *Nemorilla varia*.]—*C.R. Assoc. Française pour l'Avancement des Sciences*, 41st session (Nimes 1912), Paris, 1913, pp. 429-433.

Considerable damage to vineyards by *Cacoecia costana* has been recorded from the Gironde, the Camargue, and the Pfalz. The life-history of this Tortricid resembles that of *Oenophthira pilleriana*. It destroys young grapes, rolls up the leaves, and spins together the young shoots. In its earlier appearance and in the occurrence of two generations it differs characteristically from *Oenophthira*. *C. costana* is limited to moist or swampy regions, the larvae feeding on *Arundo, Epilobium, Iris*, &c. Moisture is an absolute necessity for this pest, as is proved by the sudden migration to swampy regions when its usual habitat is dried up during an abnormally hot season. The caterpillars reared by the author were heavily parasitised by the Tachinid fly, *Nemorilla varia*, which lays its eggs on the dorsal part of the integument of the host. The eggs are hatched towards the end of April and the larvae bore their way obliquely through the integument. Larval life only lasts for a week, but the adult fly emerges from the pupa and not from the caterpillar. The parasite always oviposits on the older caterpillars, so that the new generation is obliged to seek other hosts, caterpillars of Microlepidoptera or Geometridae. In this polyphagous habit *Nemorilla* somewhat resembles *Pimpla*.

**Plants Attacked by Diaspis Pentagona.**—*La Rivista di Agricoltura, Parma*, 6th June 1913, p. 360-361.

The following list of plants recognised as food-plants of this pest is published officially by the Italian Ministry of Agriculture:—

| | |
|---|---|
| *Celtis australis*, L. | *Phaseolus vulgaris*, Savi. |
| *Betula alba*, L. | *Fraxinus excelsior*, L. |
| *Caesalpinia japonica*, L. | *Euonymus europaeus*, L. |
| *Bignonia catalpa*, L. | *Broussonetia papyrifera*, Wetn. |
| *Ceanothus americanus*, L. | *Gymnocladius dioica*, L. |
| *Chamaerops excelsa*, Thun. | *Gleditschia ferox*, Desf. |

*Aesculus hippocastanum*, L.
*Prunus laurocerasus*, L.
*Amygdalus communis*, L.
*Paliurus australis*, Gaert.
*Olearia hastii*, Hook.
*Urtica dioica*, L.
*Pelargonium* spp.
*Populus pyramidalis*, Salisb.
*Prunus capuli*, Cav.
*Pueraria thunbergiana*, Benth.
*Ribes rubrum*, L.
*Scrofularia canina*, L.
*Salix* spp.
*Choisya ternata*, H. B. & K.
*Syringa vulgaris*, L.
*Sophora japonica*, L.
*Spiraea japonica*, L.
*Trachelospermum jasminoides.*
*Ribes uva-crispa*, L.
*Ampelopsis quinquefolia*, Mich.
*Vitis vinifera*, L.
*Cucurbita* spp.
*Berberis stenophylla*, Hau.
*Berberis aquifolium*, Pursh.
*Buddleia lindleyana*. Fort.
*Caryopteris mastacanthus*, Schaec.
*Cornus alba*, L'Her.
*Solanum dulcamara*, L.
*Sterculia platanifolia*, L.
*Fuchsia* spp.
*Morus* spp.
*Jasminum officinale*, L.
*Genista scoparia*, Lamk.
*G. triacanthos*, L.
*Kerria japonica*, D.C.
*Humulus lupulus*, L.
*Juglans regia*, L.
*Ulmus campestris*, L.
*Paulownia imperialis*, L.
*Phyllirea vilmoriana* and *decora*, Boiss. & Bal.
*Salvia officinalis*, L.
*S. fortunei*, Planch.

Kirkaldy (G. W.) & Muir (F.). **On some New Species of Leaf-hoppers.**—*Rep. Exper. Stat., Hawaiian Sugar Plant. Assoc., Honolulu*, Entom. ser., Bull. no. 12, Jan. 19[illegible] 90 pp., 3 figs.

The first part of this paper, from notes left by the [illegible] Mr. Kirkaldy, deals with species of Cicadidae collected in the Malay Archipelago by Messrs. Koebele and Muir, the sec[illegible] and larger part with Derbidae from the same region and [illegible] Fiji. Many species of the latter family are to be found in la[illegible] numbers on sugar-cane, but only in the adult stage, where th[illegible] are conspicuous on account of their sitting near together in Ind[illegible] file; they do not appear, however, to do any considerable damage. The eggs have not been discovered, but the nymphs were liv[illegible] in rotting tree-trunks. Sixteen new genera and 96 new sp[illegible] are described, but none of the family exist in the Hawa[illegible] Islands, and even if they should become established in c[illegible] fields there, the fact of the young living in rotten timber w[illegible] confine them to very limited areas.

Schellenberg (H.). **Zur Bekämpfung des Heu- und Sauerwurms.** [The control of the Vine-moth, *Clysia* (*Conchylis*) *ambiguella*.]—*Schweiz. Zeits. für Obst- und Weinb[illegible], Frauenfeld*, xxii, no. 2, 2nd Jan. 1913, pp. 27-29.

Of all insect pests in Swiss vineyards *Clysia ambiguella* [illegible] undoubtedly the most destructive, and appears regularly in th[illegible] of the Swiss Experiment Station for Horticulture and Viticu[illegible] at Wädenswil (Zürich). The caterpillar destroys the inflores[illegible] at haymaking time, hence the name Heuwurm, while the lar[illegible]

of the second generation (Sauerwurm) feeds on the grape-berries which become sour and impart the sourness to the wine. The hand-picking of the caterpillars from the vines and berries is too costly, and the plants are liable to additional injury by inexperienced hands. The custom pursued at Wädenswil of keeping the vineyards scrupulously clean, especially at the time of pruning, has had a very beneficial effect. Experiments were made with different sprays, Dufour's solution being effective, though not entirely satisfactory. Since 1909 a 3-4 per cent. solution of soft soap, either alone, or in conjunction with Bordeaux mixture, has been used with marked effect. Soft soap solution is to be preferred on account of being more easily prepared and spraying better. A mixture of caustic lime with 1 to 20 per cent. powdered "Cucasa" was also employed, partly with a view to destroying *Peronospora* at the same time, but the results were not satisfactory. In 1910 a 5 per cent. solution of "Plantasalus" was tried, but could not be considered so efficacious as soap, besides having the effect of spotting the leaves. Experiments with quassia infusion showed it to be deadly, but this spray will be submitted to further tests.

SCHNEIDER-ORELLI (O.). **Über Schwammspinner und Goldafter.** [On *Lymantria dispar* and *Euproctis chrysorrhoea*.]—*Schweiz. Zeits. für Obst- und Weinbau, Frauenfeld*, xxii, no. 2, 22nd Jan. 1913, pp. 18-22, and xxii, no. 3, 8th Feb. 1913, pp. 38-41, 2 figs.

Although the damage done to Swiss orchards by *Cheimatobia brumata* is far greater than that by *Lymantria dispar* and *Euproctis chrysorrhoea*, the latter are sufficiently plentiful to warrant remedial measures. While *Euproctis* is common in low-lying districts throughout Switzerland, *Lymantria* occurs in the Jura (southern and eastern), and in 1891 completely defoliated the beech woods near Ilfingen (Bernese Jura). On account of their hairiness these caterpillars are avoided by most birds, except cuckoos; but tits are useful in destroying the egg-masses. The best way of controlling *Euproctis* is by cutting away any twigs covered with the webs and caterpillars. In the case of *Lymantria* it is possible to protect the fruit-trees by collecting the characteristic egg-masses and by fixing strips of cloth on the trunk to catch the caterpillars which like to hide during the daytime. The paper concludes with an account of the methods employed by the U.S.A. Bureau of Entomology in fighting these pests.

SCHELLENBERG (H.). **Zur Bekämpfung der Milben- Kräuselkrankheit.** [The control of mite-curl.]—*Schweiz. Zeits. für Obst- und Weinbau, Frauenfeld*, xxii, no. 6, 20th March 1913, pp. 91-92.

At the Swiss Experiment Station for Horticulture and Viticulture crude potassium sulphide and other polysulphides were tested in vineyards against leaf-curl caused by mites. A 3 per

cent. solution of the sulphides was applied with a brush to the buds and it was found that from 150 to 250 vines could be treated in an hour, about 1 lb. of the compounds (which are about 7 per cent. cheaper than potassium sulphide) sufficing for one acre. Where women and children are not available, and vineyards have to be treated on a large scale, application with an atomiser is more economical.

ZSCHOKKE (T.). **Die Meisen in unseren Obstgärten.** [Tits in our orchards.]—*Schweiz. Zeits. für Obst- und Weinbau, Frauenfeld*, xxii, no. 11, 7th June 1913, pp. 163-164, 1 fig.

The author comments on the extraordinary efficiency with which the tits freed his orchard from *Cheimatobia brumata*, without damaging any blossoms free from caterpillars. Bullfinches, red-breasts and other birds likewise displayed great activity in detecting and destroying the pests.

**Bundesrats beschluss betreffend die Einfuhr frischen amerikanischen und australischen Obstes vom 28 April 1913.** [Decree of the Swiss Federal Council of the 28th April 1913 concerning imports of fresh American and Australian fruit.]—*Schweiz. Zeits. für Obst- und Weinbau, Frauenfeld*, xxii, no. 11, 7th June 1913, p. 173.

Every consignment of fresh fruit imported into Switzerland from America or Australia must be examined at the frontier (Basel) by expert inspectors as to the presence of the San José scale or other pests. Consignments containing pests are to be at once destroyed.

BAUDIN (Dr.). **Contre les fourmis.** [A remedy for ants.] *Moniteur d'Horticulture, Paris*, xxxvii, 25th March 1913, pp. 71-72.

One pound of hydrosulphite of soda (at $1\frac{1}{2}d.$ per pound) dissolved in one gallon of water is an excellent spray against ants, which has the additional advantage of cheapness. Where spraying is not feasible, a small quantity in a saucer placed in suitable corners or on shelves is equally effective. Ants may be destroyed in their nests by pouring the solution, boiling if possible, over the latter.

HOLLOWAY (T. E.). **Field Observations on Sugar-Cane Insects in the United States in 1912.**—*U.S. Dept. Agric., Bureau of Entomology*, Circ. no. 171, 21st March 1913, 8 pp.

The peculiar weather during the season of 1912 probably accounts, in part at least, for certain unexpected developments in insect life during the year. In Louisiana a long and cold winter was followed by a wet spring, and vast areas of land were flooded

owing to breaks in the levee of the Mississippi river. There was a slow development of the moth-borer (*Diatraea saccharalis*) and the mealy-bug (*Pseudococcus calceolariae*), which are tropical species and evidently require more warm weather than the native insects. The wet weather retarded the development of the sugar-cane beetle (*Ligyrus rugiceps*) which, according to some planters, does most damage in dry seasons and on high, sandy soils. The fall army-worm or southern grass-worm (*Laphygma frugiperda*) is more injurious during wet weather and was, therefore, extraordinarily abundant during the summer of 1912. Practically no moth-borers or mealy-bugs were found in the district near Morgan City, La., which had been flooded previous to the author's observations; and this suggests that these insects may possibly be controlled by excessive irrigation. The number of species which were detected injuring cane is surprising: some are apparently of no great importance, though there is a possibility that the sugar-cane weevil borer and the froghopper, which are now rare, may increase in numbers and become formidable pests. The sugar-cane aphid, which is widely distributed, may be capable of doing considerable damage in plantations.

GILL (J. B.). **The Fruit-Tree Leaf-Roller.**—*U.S. Dept. Agric. Bureau of Entomology*, Bull. no. 116, pt. v, pp. 91-110, 12th March 1913, 5 pls., 6 tables.

During the last few years the fruit-tree leaf-roller (*Archips argyrospila*, Walk.), which has been recorded in the U.S.A. from the Atlantic to the Pacific, appeared in enormous numbers in a few localities in Colorado, New Mexico and New York. It is a very general feeder, and has been found on black walnut, horse-chestnut, soft maple, hickory, oak, elm, wild cherry, ash, honey-locust, box-elder, sassafras, hazel-nut, cottonwood, basswood, Carolina poplar, cedar, lilac, roses, Virginia creeper, hops, vine, oats, wheat, alfalfa, red clover, onions, peas, rhubarb, etc., in addition to fruit trees and bushes. The damage is done by the larva feeding on the leaves, rolling them up and spinning webs from leaf to leaf. As soon as the young fruit has set the larva ceases feeding on the foliage, fastens one or more leaves to the fruit and attacks the latter. Damage done to apples and other fruit is usually so severe that the trees cannot outgrow the injury, thus producing a large percentage of unmarketable or second-class fruit. Some excellent photographs are given showing the nature of the damage done.

The larval stage of the leaf-rollers under observation varied from 24 to 35 days, the pupal stage from 9 to 15 days, and the adult or moth stage from 2 to 3 days for the males and 3 to 4 days for the females. Under normal conditions the life of the moths is probably longer. Females were depositing eggs between two and three days after emergence. Under Colorado conditions the egg-laying period extended from about the second week in June to the middle of July, the maximum being reached from 20th June to 10th July. The eggs remain on the trees unhatched until the following spring; there is, in consequence,

only one generation in the course of the year. Generally speaking, the eggs will begin hatching about the time the cluster buds of early-blooming varieties of apples are beginning to show, but before they have fully separated.

The following birds have been observed feeding upon the larvae of the fruit-tree leaf-roller: The bluebird (*Sialia sialis*), western robin (*Planesticus migratorius propinquus*), catbird (*Dumetella carolinensis*), red-winged blackbird (*Agelaius phoeniceus phoeniceus*), orchard oriole (*Icterus spurius*), kingbird (*Tyrannus tyrannus*), phoebe (*Sayornis phoebe*) and English sparrow (*Passer domesticus*).

Parasitic insects reared from the larvae and pupae of the fruit-tree leaf-roller are:—*Pimpla pedalis*, Cress., *Itoplectis conquisitor*, Say, *Epiurus indagator*, Walsh, *Meteorus archipsidis*, Vier., *Exorista nigripalpis*, Towns., *E. pyste*, Walk., *E. blanda*, O.S., and *E. cheloniae*, Rond. *Calosoma scrutator*, *Notoxus monodon* and *Formica montanus* have been observed to prey upon the larvae and pupae.

Spraying experiments were made at Española, N. Mex., and Canon City, Colo., which showed that miscible oil ranging in strength from 1:10 to 1:20 gave the best results. Crude petroleum, kerosene and 10 per cent. distillate oil emulsions ranked second in effectiveness. Commercial lime-sulphur solution was found to be ineffective, as was whitewash. Arsenicals, alone or in combination with tobacco, were not altogether satisfactory. Vast numbers of moths were caught by means of light traps, but so far as could be determined there was little difference in the number of egg-masses laid on the trees in these orchards and in those in which traps were not used. Under orchard conditions there is no hope of controlling the leaf-roller by destroying the egg-masses by hand; but systematic spraying with miscible oil just before the buds burst in the spring, and in badly infested districts a second spraying with arsenate of lead (3 lb. to 50 gallons of water), applied when the larvae are emerging from the eggs, will keep the pest under control.

MARCHAL (P.). **Rapport phytopathologique pour l'année 1912.** [Report on injurious insects in France during the year 1912.]—*Bull. Agric. de l'Algérie et de la Tunisie*, no. 9, 1st May 1913, pp. 193-199.

*Cereals.*—Cereals have not suffered greatly during the past year from the attacks of insects, but *Chlorops* has done some damage in Ariège, Elaterid larvae in the Loiret, Seine-Inférieure and Côtes-du-Nord, and *Agrotis* in La Vendée. Thrips continues to cause damage to wheat in the Indre. In Morbihan, *Tylenchus devastatrix* has done much damage to oats.

*Meadows and forage crops.*—Lucerne was badly damaged during April and May by *Colaspidema atrum* in the departments of the Aude, Pyrénées-Orientales and Bouches-du-Rhône, and in many places the first cutting had to be made prematurely in

order to save it. The second cutting has also suffered in the south especially in Haute-Garonne, Tarn-et-Garonne and Var. This pest has also made its appearance in Vendée at Fontenay-le-Comte. Vetches and other leguminous forage crops have suffered severely from aphis attack in Cerdagne, the Pyrenées-Orientales, Loir-et-Cher, la Sarthe, and l'Isère. In Tarn-et-Garonne the seed crops of clover suffered considerably from the attack of *Apion apricans* in July.

*Beetroots and potatoes.*—In the Aisne, *Silpha opaca* has been reported, but has not done very serious damage anywhere. The beet crops suffered from the attacks of *Haltica* in May and June in the following departments, Ille-et-Vilaine, Dordogne, Indre, Puy-de-Dôme, Tarn-et-Garonne, Gard and others; and *Aphis papaveris* has appeared in large numbers on the seed beet in Pas-de-Calais and Loiret. Professor Marchal points out that the habit of this insect of breeding upon the spindle-tree (*Euonymus*) makes it desirable that this tree should be eradicated in the neighbourhood of beet fields. The potato moth (*Phthorimaea operculella*) remains in the department of the Var round about Hyères, Carqueranne and Bornes.

*Kitchen garden crops* have been chiefly attacked by *Haltica*, which has done special damage to cruciferous plants and of these to sowings of cabbage and turnip in the following departments:—Pas-de-Calais, Côtes-du-Nord, Dordogne, Ardèche, Finistère, Ille-et-Vilaine, Puy-de-Dôme, Lozère, Corrèze. Peas and beans throughout the greater part of France have suffered seriously from aphis attack. The caterpillars of *Pieris* have been less numerous than in 1911, but they have nevertheless done great damage to cabbage crops in the centre of France, in particular in Aveyron and Cantal. In the Pyrénées-Orientales artichokes have suffered as in 1911 from the attacks of *Apion carduorum* and *Depressaria subpropinquella* (var. *rhodochrella*, H.S.). The green caterpillar of this latter species is known to the cultivators of the district under the name of the Artichoke Pyralis. Carrots have been attacked by the caterpillars of another species of the same genus, *D. marcella*, in the Bouches-du-Rhône (district of Saint-Remy), and this or a related species has also done much damage to fennel at different places.

*Fruit Crops.*—*Anthonomus pomorum* has destroyed the apple blossoms to a very large extent in Brittany and Normandy especially in the departments of Morbihan and Manche. The attack of this insect was exceedingly severe in Oise, Sarthe, Yonne, Puy-de-Dôme, Ardèche, Aveyron, Haute-Savoie and Dordogne. Throughout France in general fruit trees have suffered much from aphis. In Savoy the caterpillars of *Cheimatobia* have been abundant on apple trees; damage by them is reported from Sarthe, Yonne, Puy-de-Dôme, Aveyron and Gard. *Hyponomeuta malinellus* continues to increase on apple and almond trees in the department of Basses-Alpes. In the Bouches-du-Rhône the almond trees have also suffered severely. In the neighbourhood of Orleans the fruit trees have lost great numbers of branches through the attack of *Cephus pygmeus*, and in the Drôme the plum worm (*Carpocapsa funebrana*) has caused the early fall of

a large quantity of fruit. Blackcurrants in the Côte-d'Or have suffered much from the attack of *Trochilium tipuliforme*. As the growers do not burn the clippings the breeding of this insect is distinctly encouraged.

*Vineyards.* *Clysia ambiguella* has done very little damage this year and the reports from all districts indicate that both caterpillars and insects have appeared in small numbers; nevertheless, in certain places, especially the low damp grounds of the Mâconnais, Haute-Savoie, Bouches-du-Rhône and Hérault, they have appeared in considerable numbers. *Polychrosis botrana* has not done so much damage as in previous years, but has nevertheless continued its attack in a large number of vineyards. It has done serious damage especially in Beaujolais, the Mâconnais and Bordelais. New centres have appeared in the Pyrénées-Orientales, especially round about Banyuls. The caterpillars have appeared in abundance at Châteauroux near Angoulême and in the departments of Vienne, Ain and Gers. With the exception of the valley of the Loire and especially Loir-et-Cher and Loiret, *Oenophthira pilleriana* has been more or less scarce. A new *Tortrix* pest of the vine (making a fourth) *Cacoecia costana*, which had already been observed by Koerig in the Gironde, requires notice. Certain vineyards of the Camargue district have been seriously invaded this year by the omnivorous caterpillars of this moth. The damage done was quite equal to that caused by *Oe. pilleriana*, but fortunately the outbreaks were exceedingly local. Moisture seems to be an essential condition for its development, and there are two generations in the year. *Haltica* although reported everywhere, has caused less damage than in previous years and their early disappearance is partly attributable to *Sporotrichum globuliferum*. M. Picard has observed great numbers of this insect killed by the fungus in the neighbourhood of Montpellier. The second generation was however very abundant in the Saône-et-Loire and from one year to another the number of vineyards attacked by this pest in the department of the Rhône seems to increase. In the Côte-d'Or, *Haltica* has been reported from Beaune and Volney. *Byctiscus betulae*, L., is diminishing and has only done appreciable damage in certain large vineyards on the banks of the Loire. The caterpillars of *Agrotis* were so numerous in the spring in the neighbourhood of Béziers as to cause great apprehension to the vineyard owners of Hérault, but fortunately most of them were killed by a bacterial disease and, excepting at certain places, the number of buds eaten was very much less than had been expected. Similar damage by the caterpillars of Noctuids had been reported from Vaucluse, Aude, Pyrénées-Orientales and also in the Marne, in a vineyard in the Valley of the Aude. *Phylloxera* has spread in a most disastrous manner throughout the Marne, favoured by the drought of 1911. Not only has it broken out in previously infected localities, but also in a large number of new centres. The pest has made great progress in the Meurthe-et-Moselle and communes which showed but one or two infected centres in 1910 can now show 30 or 40. 'Erinosis' has been very prevalent in the Aube, Marne, Côte-d'Or, Saône-et-Loire, Puy-de-Dome, Yonne and Dordogne, and has

caused some damage by invading the grape clusters. *Nysius senecionis* has invaded many vineyards in the Hérault, Gard, Aude and Bouches-du-Rhône. The damage done has been especially evident in recently planted vines intended to be grafted or which had been recently grafted. In many places several hectares of vines have been withered up under the attack of myriads of these insects. Professor Marchal says that it is quite easy to prevent the damage done by *Nysius* by carefully weeding out all wild Cruciferae, which are their special food-plants, by hoeing between the vines in the month of May and *not* in the month of July.

*Southern Crops.*—The most important fact noted with regard to these crops is the appearance in the Alpes-Maritimes, near Beaulieu-sur-Mer, of *Icerya purchasi*, which appears to have been introduced about two years ago on plants coming from Naples, where there has been a breeding centre for this insect since 1900. The first specimens were received at the Entomological Station in Paris in the month of March 1912. Measures have been taken to introduce *Novius cardinalis* from Italy, Portugal and the United States, and the propagation of this natural enemy of *I. purchasi* in France may be regarded as an accomplished fact, and Professor Marchal is of opinion that there is now but little need to fear that the pest will make any great progress. *Diaspis pentagona*, though not always reported in France, has been found at Mortola on the frontier, though fortunately in an exceedingly localised centre. The olive fly (*Dacus oleae*) has caused serious damage throughout the whole of the warm portion of the littoral of the Alpes-Maritimes, and according to the olive-growers the invasion of this pest in the Gard has been greater than ever before. The arsenical treatment on the Gillis-Berlese plan has proved satisfactory when the olive groves are sufficiently isolated to prevent danger of re-infection. The olive *Tinea* has caused the fall of a large amount of fruit, especially in Vaucluse and Gard. According to M. Chapelle, nicotine sprays used as a preventive have given very much better results than arsenate of lead as an insecticide. *Simaethis nemorana* has multiplied to an extraordinary extent in Hérault and has done great damage to fig trees. The larvae of these insects have done special damage to the beetroot and potato in the departments of Saône-et-Loire, Doubs, Haute-Marne, Aisne and Morbihan. They have also been very abundant and have caused serious damage in the Isère and Hautes-Alpes. The insects themselves have been specially numerous in Haute-Savoie where the oaks have been largely defoliated by them, otherwise they have been relatively scarce over the greater part of France.

Navás (L.). **Crisópidos sudamericanos.** [South American Chrysopidae.]—*Brotéria, Salamanca*, Ser. Zool., xi. fasc. 2, June 1913, pp. 73-104.

The first part of a systematic list of South American Chrysopidae, of which 40 species are described, comprising one *Chrysopiella*, one *Hypochrysa*, 13 *Leucochrysa*, and 25 *Chrysops*.

CARCANO (P.). **Il pidocchio sanguigno del malo.** [The Red Apple Aphis, *Schizoneura lanigera.*]—*La Rivista di Viticoltura, Enologia ed Agraria, Conegliano,* (5) xix, no. 3. 1st Feb. 1913, pp. 67, 68.

In Italy the best time to attack the Aphis is in March, by cutting off and burning those branches on which the largest numbers are to be found. So far as possible the larger branches should be brushed in the same way as has been recommended for *Diaspis pentagona*, and the parts attacked treated with an insecticide. The following is recommended:—heavy oil of tar 1¾ oz., soap 5 oz., water 1 gallon. The water and soap are boiled together and the oil of tar slowly added the while. This mixture should be laid on with a brush and thoroughly stirred each time the brush is dipped into it, and it is also advisable that it should all be used within two days, as it has a tendency to lose its effect if kept. Special care should be taken to treat the part of the trunk just above and just below the ground. The author further recommends that the branches should be sprayed with a three per cent. soap solution, and that in the spring the whole tree should be sprayed with a two per cent. solution of "pitteleina" or "rubina."

**La coltivazione del Piretro.** [The cultivation of Pyrethrum.] *La Rivista di Viticoltura, Enologia ed Agraria, Conegliano,* (5), xix, no. 4, 15th Feb. 1913, p. 94.

Insecticides having pyrethrum for their basis are not very generally used, as the high price of pyrethrum powder operates adversely to their employment. At present *Pyrethrum cinerariaefolium* is cultivated almost exclusively on the eastern coast of the Adriatic in Dalmatia, Montenegro and Albania, and not in Italy.

It is suggested by E. Cirelli that the plant may be easily cultivated on the Italian side of the Adriatic as it is a hardy plant, bears both drought and cold well, and thrives in a dry, loose soil. The seeds are sown in the spring and the seedlings planted out in the autumn. According to Cirelli there is a profit of from £120 to £140 per hectare (2·47 acres) on its cultivation. There is however one difficulty to which attention has been drawn more than once, namely that of procuring seed.

MARTINI (S.). **Sulla lotta contro le Tignuole dell'uva.** [The struggle against the Vine Tineids.]—*La Rivista di Viticoltura, Enologia ed Agraria, Conegliano,* (5) xix, no. 8, 15th April 1913, pp. 178-179.

The Technical Institute at Arezzo has made experiments as follows on four plots:—

(*a*) was treated with a simple copper lime spray;

(*b*) with a mixture of "rubina" 3 lb., sulphate of copper 2 lb., water 20 gallons;

(c) Bordeaux mixture with one per cent. of creolin; and

(d) Bordeaux mixture with two per cent. of carbolised extract of tobacco.*

The spraying was done on the 10th July and the examination on the 28th August yielded the following results:—

(a) 1,160 bunches, 280 attacked, equal to 24 per cent.

(b) 1,168 bunches, 92 attacked, equal to 7·87 per cent.

(c) 1,180 bunches, 80 attacked, equal to 7·77 per cent.

(d) 1,140 bunches, 64 attacked, equal to 5·61 per cent.

SWAINE (J. M.). **Tent Caterpillars.**—*Dept. Agric. Dom. Canada, Div. Entomology*, Entom. Circular no. 1, 1913, 14 pp., 8 figs.

Outbreaks of the Tent Caterpillars *Malacosoma americana*, F., and *M. disstria*, Hübn., occur from time to time in different parts of Canada, causing serious damage. This has been the case during the past two years in the provinces of New Brunswick, Quebec, Ontario, and British Columbia. *M. americana* is most common on fruit trees, wild cherry and hawthorn, but when very abundant it readily attacks a variety of shade and forest trees. *M. disstria* prefers poplar, birch, elm, oak, maple and other forest trees. It is also found in orchards, particularly in years of great abundance. In 1912 these two species, and especially the latter, have stripped many thousands of trees in the districts named. Square miles of poplar and birch have been completely defoliated. Last summer it was not uncommon for trains on the Gatineau River line to be stopped by myriads of caterpillars swarming on the rails, which were effectively greased by their crushed bodies; similar cases are reported from New Brunswick and British Columbia. Both species are native, and there are records of outbreaks in Massachusetts as early as 1646. The habits and life-history of both species are described, and the figures amply illustrate the caterpillars and the manner in which the eggs are laid on twigs. The author gives a long list of birds which are said to feed to a greater or lesser extent upon the eggs and caterpillars and greatly assist in reducing their numbers. He urges that the native birds of Canada should be protected on account of their value in keeping down insect pests. Among the artificial methods of control the destruction of the egg-masses before the 1st April is useful, but is only profitable on the more valuable fruit and shade trees. The forest tent caterpillar will usually drop to the ground if the branches of the tree be jarred, and this method is also of some service, provided that the caterpillars are carefully collected and destroyed. Banding the trees with tanglefoot and other sticky mixtures is also useful, but requires constant renewal. The nests may be destroyed by long-handled tree-trimmers or by burning with a torch. Asbestos fibre soaked in petroleum and placed in a tin can nailed to the end of a pole is said to make an

* "Estratto fenicato di tabacco" is a preparation of tobacco juice, to which a certain portion of phenol is added to prevent its use for other purposes, sold by the Italian Government to agriculturists.—ED.

excellent torch. The burning method however requires considerable care in use. Petroleum emulsion will kill the caterpillars if applied directly with a sprayer. The cocoons may be also collected. The author suggests that these should be placed in a box covered with a coarse wire netting, with a mesh of 3/16ths of an inch. This will allow useful parasites to escape. If sprays are used, Paris green or lead arsenate (2 lb. to 40 gals. of water) are recommended. The former mixture is directed to be made as follows:—Paris green 1 lb., best quick-lime 2 lb., water 160 gals.; the Paris green and the slaked lime are carefully mixed together and then the whole made up to the quantity required; the mixture requires to be constantly stirred when in use.

**Dalmasso (G.).** **La Lotta contro la *Diaspis pentagona* nel Giappone e in Italia.** [The struggle against *Diaspis pentagona* in Japan and in Italy.]—*Rivista di Viticoltura, Enologia ed Agraria, Conegliano,* (5) xix, no. 2, 15th Jan. 1913, pp. 38-40.

It has been thought for a long time that this pest, imported into Europe from Japan, was not the cause of much loss in its native country, but the contrary is the case, in spite of the presence there of natural parasites in such numbers as to constitute a more or less effectual check on its development. For the past ten years artificial means have been in use for keeping it under control, and Sasaki in describing *Diaspis patelliformis* in Japan gives the following methods which he advises to be used against *Diaspis pentagona*:—

(1) To rub the affected parts of the stem or trunk of tree attacked with bunches of straw, and then to paint over these parts with petroleum or a mixture of ¼ oz. of soap to a quart of petroleum with a little water added.

(2) To spray or brush over the plants with the following mixture:—Sulphur ½ oz., quick-lime 8 oz., water 4 gallons; the whole to be thoroughly boiled together.

(3) Fumigate all plants received with hydrocyanic acid for from three-quarters of an hour to an hour, before planting out.

The author (G. Dalmasso) lays great stress on thorough brushing and painting of the trees with insecticide emulsions having oil of tar for a basis. The brushing should be done in the winter with strong wire brushes, and at this season there is no necessity for collecting and burning the fragments of bark, because then only the legless females are present which are incapable of climbing up the plants. He remarks that there are large numbers of proprietary anti-Diaspis remedies on the market, many of which are of doubtful value, but he mentions the following mixture as being very useful:—Water 20 gallons, heavy oil of tar 11 pints, common turpentine 1 pint, 14 lb. of common salt, and 2 lb. of flour; the salt is dissolved in the water and the flour is added and then the oil of tar. A Milan firm prepares a special

...ty of oil of tar called "eusol," but where this is used ... grms. of salt, instead of 700, as in the previous formula, is ... cient. Both these emulsions are said to be very stable and ... be kept for a long time. They are best applied on a damp ... cloudy day in winter.

KERSHAW (J. C.). **Froghoppers.**—*Dept. Agric., Trinidad,* Special Circular nos. 4 and 5. 3rd March 1913, and no. 6, 27th March 1913.

The cane-fields in Trinidad seem deficient in insects and spiders ...h prey on the adult froghopper, although they are very ...tiful on adjoining grass-land. It would therefore be advan...geous in large cane-fields to leave a small plot of cane (½ acre) ...t about the middle, in which beneficial insects might find ...ange and breed, and whence they could later on spread over ... new cane. The planting of trees and shrubs on waste ground ...djoining cane-fields would encourage the spread of the Tick...ird (*Crotophaga ani*) and other useful birds.

The failure of carbon bisulphide as an insecticide for frog...opper nymphs is partly due to the protection afforded by their ...ittle and the fact that the tergal plates and pleura of the ...domen are greatly produced and bent around the underside ... the abdomen till the opposing ends touch one another, thus ...rming a large air-chamber or reservoir. The air contained ... the chamber is sufficient to last the nymph for some consider...ble time.

Throughout the dry season in Trinidad (so far as ascertained ... the end of March) the froghopper continues to breed, though ... much smaller numbers than in the wet season, and chiefly ...mongst grass in damp localities. The chief damage to young ...ane is caused by the attacks of the nymphs on the roots, yet if ...resent in very large numbers on the leaves, the adults do much ...mage, because of the large amount of sap which they drain ...om the tissues of the plants. The egg-parasites of the frog...pper having been found on sugar estates, it seems advisable ...ot to destroy the trash, but to leave it as long as possible on ... fields, till it is required to be used as a fertiliser. This will ...ve the parasites a chance of hatching out and escaping; and ... the trash is left and not piled into 'boucans,' it is, in the ...uthor's opinion, unfavourable rather than otherwise to the frog...pper eggs.

BURGESS (A. F.). **The Dispersion of the Gipsy Moth.** — *U.S. Bureau of Entomology,* Bull. no. 119, 11th Feb. 1913, pp. 1-62, 3 figs., 16 plates, 4 maps.

This paper is the result of extensive studies made to deter...ine the means by which the gipsy moth has spread in the New England States, causing, as is well known, enormous injury to gardens and forests. From the Medford, Mass., district in 1869, the pest had spread in 1912 as far north as Whitefield, M.., west to the Connecticut River, and south to Newport, R.I.

Suppression measures were abandoned by the State of Massachusetts in the winter of 1900; subsequent severe caterpillar outbreaks, however, which not only destroyed woodlands, but even made houses uninhabitable, led to the organisation, early in 1905, of a State scouting force which reported (1912) that 10,000 square miles are infested with the pest.

It is impossible to give a detailed description of the cause of every infestation. The weather records provide strong evidence that the wind is responsible in a large degree for the spread of the gipsy moth, other means of dispersal being driftwood, vehicles (especially motor-cars), clothing and, to a negligible extent, birds. Numerous experiments were made, with the assistance of the U.S. Bureau of Entomology, regarding dispersal by wind. One condition favouring wind-spread is the presence of large woodland colonies which are overpopulated with caterpillars. This stimulates activity on the part of the insects in search of food and affords opportunities for them to be carried away by the wind. Weather records for the past ten years show that the prevailing winds during April and May, when the temperature is high enough to make the caterpillars sufficiently active, are for the most part from the south and south-west. The character of the food supply has a very important bearing on the dispersion of the gipsy moth, because the caterpillars will not survive unless they are able to find lodgment on favourable plants. First-stage caterpillars cannot survive on pine foliage, and large blocks of Coniferae or other unfavourable food-plants will prevent the establishment of the insect. National legislation should provide for the inspection of lumber products or other material which is likely to carry the gipsy moth from the infested area in New England to distant points in the United States. The scouting work, which has to do with the determination of the limits of the spread of the pest, is of great importance. This is being carried on in the infested towns on the margin of or outside the infested area, and too much stress cannot be laid on its thorough prosecution. The men actively engaged in it should be instructed thoroughly in regard to the best methods of thinning woodland, so that practical advice can be given to the owners of forest land to stimulate them to take proper measures for protecting their property before the infestation becomes serious enough to cause severe injury.

The text is accompanied by photographs illustrating very clearly the ravages caused by the gipsy moth, its egg-clusters and the screen-traps used in testing the dispersal of caterpillars by wind. One large coloured map and three smaller maps in the text show the dispersion and present distribution of the gipsy moth in New England.

Vercier (G.). **Les Fraisiers à gros fruits.** [Large-fruited strawberries.]—*La Vie Agricole et Rurale, Paris,* ii, no. 13, 1st March 1913, pp. 371-374.

The author notes as insects injurious to strawberry crops:— The "ver blanc," which he says is very difficult to destroy; *Otiorrhynchus sulcatus*, which eats the leaves during the night.

... is not a very common pest; and *Rhynchites fragariae* (la ...), which cuts the petioles of the leaves and the stalks of ... flowers. He recommends spraying the leaves, before the ... are formed, with a one per cent. solution of lysol. Against *...nychus telarius* (Red Spider), which is specially common on strawberry plants grown under glass, the best remedy is spraying with an aqueous solution of nicotine.

...NIS (—). **Contre les Anthonomes.** [The destruction of *Anthonomus pomorum*.]—*Moniteur d'Horticulture, Paris*, xxxvii, no. 6, 25th March 1913, p. 72.

The destruction of *Anthonomus pomorum* is notoriously difficult, and the author describes a method by which it is possible (allowing 150 insects per tree) for three men to destroy about 15,000 of them per diem, and which has the merit of simplicity. A tarpaulin is slit to the centre and provided with a circular hole in the middle so as to fit round the trunk of the apple tree. The tree is then shaken and the insects collected on the tarpaulin are destroyed with boiling water or with some benzine, or essence of turpentine. This procedure may be assisted by fumigation or by spraying with weak solutions of paraffin oil, vinegar or lysol.

P...E (E.). **Le Puceron lanigère.** [Woolly Aphis.]—*Rev. Mens. Soc. Entom. Namuroise*, March 1913, pp. 39-39.

The author says that he has made use of a method described by M. R. Geerinckx in the Flemish journal, "De Toekomst," with success. A stiff brush soaked in Carbolineum was used for brushing the aphides from the trees, and the place occupied by them and all rough places and cracks in the bark were carefully treated with the same material.

**The Plantations Preservation Decree.**—*The Zanzibar Gazette*, 28th April 1913.

Any person who is in charge of any land whereon are coconut trees shall, whenever any such tree is dying or dead or attacked by any insect (i.e. *Oryctes rhinoceros*) or parasite (i.e. 'Kirukia,' *Loranthus*), cause the same to be consumed by fire or to be buried in the ground at a depth of not less than three feet, or to be entirely submerged in water, or to be otherwise disposed of in such manner as the Inspector may direct.

HENDERSON (Prof. J.). **The Practical Value of Birds.**—*Univ. of Colorado, Boulder, Col.*, Bull. no. xiii, no. 4, April 1913, 48 pp.

This is a useful introduction to American economic ornithology, and the author in discussing the dangers resulting from man's interference with the balance of nature, either by destroying species or introducing alien species into a new habitat, points out the

irrationality of recklessly killing birds by the hundred thousand for 'sport' and millinery. If the birds were all destroyed, agriculture in the U.S.A. would instantly cease on account of insect and other pests. Birds which ordinarily take small numbers of insects, take them in much larger quantities when they are abundant. The number of species and subspecies of birds in the various states of the Union ranges from about 2.. to 530, the latter number being credited to California, while .. are claimed for Colorado. A discussion of the nature and quantity of stomach contents of birds, and the necessity of bird protection is followed by an account of the species investigated, which occupies the second half of the bulletin and contains valuable statistical evidence. Not the least useful part is a bibliography containing about 150 references to papers dealing with the relation between birds and insects and other pests.

**Le Scorie Thomas nella lotta contro i Pidocchi delle Barbabietole.** [Basic Slag, a remedy against the beetroot aphis.]—*Riv. di Agricoltura, Parma*, xix, no. 20, 15th May 1913, pp. 309-31.

The use of basic slag in fine powder against the beet and .. aphis has been reported by several German beet-growers as productive of good results, if strewn over the fields at the rate of 300 to 400 kgs. (661 to 882 lb.) per hectare (2·47 acres), and it is said that in about eight days after this treatment the aphis disappears. Prof. D. Cavazza, of Bologna, has made use of this remedy with good effect on beans and has also obtained encouraging results against the *Oidium* of the vine.

THEOBALD (Prof. F. V.). **Some New and Unusual Insect Attacks on Fruit Trees and Bushes in 1912.**—*Jl. Board of Agric., London*, xx, no. 2, May 1913, pp. 106-116, 2 figs.

Amongst insects of special interest is an Apple Leaf Sawfly (*Lygaeon ematus moestus*, Zaddach) hitherto unrecorded in Great Britain, and two new aphides, *Myzus fragariae*, sp. n., on strawberries and *Rhopalosiphum brittenii* on currants. The Beech Orchestes (*Orchestes fagi*) has been found feeding on apples in Devonshire, and the Ash and Willow Scale (*Chionaspis salicis*) attacking currants at Woburn and Wye. The Garden Chafer (*Phyllopertha horticola*) has been recorded as attacking apples, the Board of Agriculture having records of this beetle attacking apples, pears, raspberries, strawberries and currants. The V-moth (*Halia wavaria*) has been found on currants and gooseberries in Bedfordshire. In Suffolk and Hereford a new Capsid (*Atractonomus* sp.) has been damaging apples. The Pear Leaf-curling Midge (*Cecidomyia pyri*, Bouché) has done considerable damage in one locality near Maidstone to all varieties of pear trees, though some showed a greater resistance than others. The spreading of one of the naphthaline preparations beneath the trees when the larvae fall to the earth would be a useful remedy. The Sycamore Coccus (*Pseudococcus aceris*) has been recorded as

...king apples at Boughton Aluph and birch trees at Godalming. The dark green Ribes Aphis (*Aphis grossulariae*, Kalt.) has been very destructive from Cumberland to Devonshire, causing the tops of shoots of gooseberries and currants, especially red currants, to become much stunted and producing a dense tuft of terminal leaves. Nothing but actually dipping of the attacked tips in tins of nicotine wash or paraffin jelly has any effect. This aphis frequently ruins the growth of young gooseberry bushes. In 1911 apple leaves from several localities showed a somewhat obscure diseased appearance. A certain amount of Red Spider (*Bryobia* sp.) occurred, but the damage did not resemble the typical *Bryobia* attack, the leaves being blotched with irregular brown and dark spots. In August 1912 leaves of several varieties of apples similarly attacked were received from Sevenoaks, and beneath these were found short, thick, almost conical, yellow mites belonging to the genus *Epetrimerus*, and closely allied to, if not identical with, either *E. armatus*, Canestrini, found on *Crataegus oxyacantha*, or *E. malinus*, Nalepa, found on apples. The mites are easily destroyed by spraying with paraffin jelly.

CHAPAZ (G.). **Les bouillies mouillantes.** [Sprays of high wetting power.]—*Bull. Agric. de l'Algérie et de la Tunise, Algiers*, 1st May 1913, pp. 187-191.

This paper is a lengthy résumé of one recently published by M. Ravaz in the 'Progrès Agricole et Viticole,' upon his experiments on the wetting power of various spraying mixtures.

Soap mixtures are of real value but they have this inconvenience, that they are always more or less costly and require care in preparation. The formula of Vermorel and Dantony for what is known as Burgundy mixture with soap, is still said to be one of the best, and is as follows: Sulphate of copper, 2 kgs. ($4\frac{1}{2}$ lb.); washing soda, 1·2 kgs.; white soap or oleate of soda, 2 kgs.; the copper sulphate is dissolved in 50 litres of water the carbonate of soda in 25 litres separately and added to the former very slowly with vigorous stirring, so as to prevent the formation of soluble carbonate of copper; lastly the 2 kgs. of soap, carefully dissolved in the 25 litres of water, are added to the whole, the resulting mixture should be alkaline. The writer refers at length to the original paper of Vermorel and Dantony, (C.R. Acad. Sci. Paris, 13th May 1912) and to papers by Astruc and Philipponat dealing with the details of preparation of many of these mixtures. Weinmann says that a neutral or alkaline Burgundy mixture to which $\frac{1}{2}$ kg. of alkaline polysulphides and $\frac{1}{2}$-1 kg. of white soap has been added has great wetting power. The above quantities suffice for a hectolitre, and he says that they may be prepared without difficulty, the polysulphide being added at once with vigorous stirring; the soap should be melted hot with sufficient water in a separate pot and while still boiling slowly added to the above mixture with constant stirring. If properly done, there is no fear of the formation of lumps of copper soap compounds. The precipitate of polysulphide of copper is so exceedingly fine that it remains for a long time in suspension.

A preparation of mixtures in which resin is made to take the place of soap is also discussed. Chapaz says that a wetting property of great power could be communicated to these mixtures by the use of Sapindus nuts (soap nuts) or by Saponaria bark, which can be easily obtained in Marseilles. He says that if the nuts are not previously shelled, but only broken, it must be remembered that the shells constitute 64 per cent. of the fruit. In order to prepare the mixture the shells are boiled for half an hour in water (2 or 3 litres for every 400 grms. of shells), at the end of which time the liquor is strained and used for the preparation of the mixture. He gives the following formula: Sapindus shells, 400 grms.; petroleum, 500 grms.; sulphate of copper, 2 kgs.; carbonate of soda, 1 kg.; water, 100 litres. The sulphate of copper is dissolved and poured into the decoction of nuts, and the carbonate of soda added last.

Vermorel and Dantony advise the following as being of great wetting power: neutral acetate of copper, 1 kg.; gelatine, 10-20 grms.; water, 100 litres. The acetate is first dissolved and the gelatine, previously dissolved in water, is added afterwards. Glue or painters' size may be used instead of gelatine, provided a larger quantity be employed, that is to say, 50-100 grms.

Gahan (A. B.). **New Ichneumonoidea Parasitic on Leaf-mining Diptera.**—*Canadian Entomologist*, xlv, no. 5, May 1913, pp. 145-154.

The author describes the following:—Braconidae: *Opius utahensis*, sp. n., found at Salt Lake, Utah; host, *Agromyza parvicornis*. *Opius suturalis*, sp. n., found at Tempe, Arizona; host, *Agromyza pusilla*.—*Opius aridis*, sp. n., also found at Tempe, and parasitic on the same fly.—*Opius bruneipes*, sp. n., found at Lakeland, Florida: host also *A. pusilla*. *Opius succineus*, sp. n., found at Lafayette, Indiana; host, species of *Agromyza* mining leaves of *Panicum*.

Alysiidae: *Dacnusa scaptomyzae*, sp. n., found at College Park, Maryland; host, the dipterous leaf-miner, *Scaptomyza flaveola*, Mg. *Dacnusa agromyzae*, sp. n., found at Lafayette, Indiana; parasitic on *Agromyza angulata*.

Stauder (H.). **Beiträge zur Biologie der Raupen von *Lymantria dispar*, L., und *Phalacropteryx praecellens*, Stgr.** [Contributions to the biology of the caterpillars of *Lymantria dispar* and *Phalacropteryx praecellens*.]—*Zeits. fur Wissenschaftl. Insektenbiologie*, ix, no. 5, 20th May 1913, pp. 148-151.

In the course of his duties as a railway official in Spalato, Dalmatia, the author had occasion to report a goods train held up between Knin and Siveric on account of 'worms' on the rails. Inquiries elicited the information that every year in June the

morning goods train had to be stopped between those stations because of a mass of gipsy moth caterpillars, about 15-20 cm. in diameter and 100 to 200 metres in length which moved slowly onward and had to be swept off the rails before the train could proceed. The surrounding country is covered with oak scrub and undergrowth, of which the author witnessed the process of defoliation by the gipsy moth at a rate of about 5 to 10 square kilometres a day. Completely defoliated oaks were also observed near Repentabor, Dutvolje-Skopo, Dugopolje and Sinj; in Middle Dalmatia, and near Pinguente and in the Draga Valley in Istria. Clusters of more than 2,000 eggs were by no means rare and the damage to the oak trees of the Karst is enormous; the authorities, however, seem to be apathetic as regards the ravages of *L. dispar*.

MAYNARD (P.) & FREDERICK (T.). **Culture de l'Artichaut dans le sud-ouest de la France.** [Artichoke-growing in S.W. France.] *La Vie Agricole et Rurale, Paris*, ii, no. 28, 14th June 1912, p. 47.

Among the parasites damaging these plants the authors mention the grubs of cockchafers as eating the roots and advise as a remedy the collection of the beetles. A green beetle of the genus *Cassida* eats the leaves and heads, and whole plantations are often destroyed by the larvae. Collection of the adults is at present the only remedy, as the authors say that insecticides have but little effect. The leaf aphis does little harm and can be got rid of by nicotine sprays or soap-suds, and the species which attacks the stem at its exit from the ground is destroyed by earthing up; an emulsion of petroleum (200 grms. soft soap, 100 grms. washing soda, 200 c.c. petroleum, 10 litres water) is also said to be very effective.

PAILLOT (A.). **Le ver des pommes** (*Carpocapsa pomonella*).—*Rev. Phytopathologie Appliquée, Paris*, i, 5th June 1913, pp. 1-4, 4 figs.

After giving the history and biology of this pest at some length the author describes the various methods of attacking it in general use and strongly recommends that the advice of Decaux should be followed, *viz.*, the immediate collection of all windfalls, as it is known that the larva quits the apple within 24 hours of its fall; the thorough hoeing and raking of the soil between and under the trees and the collection and burning of all leaves, bark and rubbish. Turning the soil to a depth of 6 inches is said to bury any pupae that may exist deep enough to prevent the imago from ever reaching the surface. These methods are simple and cheap, and are said to be very effective supplements to the usual lime-washing, banding &c.

PARKER (W. B.). **The Red Spider on Hops in the Sacramento Valley of California.**—*U.S. Bureau of Entomology*, Bull. no. 117, 3rd May 1913, 41 pp., 9 figs., 6 pls.

During the past few years the 'red spider' (*Tetranychus bimaculatus*, Harvey) has become recognised as one of the most injurious of hop pests on the Pacific Coast, especially in the Sacramento Valley, Cal. It was reported from Wheatland, Yuba Co., Cal., in 1902 and since then has damaged hop-fields near Sacramento every year, one company estimating the financial loss due to this mite (allowing 14 cents per lb. for hops) to be from $40 to $68 per acre. Other growers suffered an even greater loss, the hops sometimes being so badly injured that they could not be picked at all. In the state of Washington the fight against the pest has been hopeless, and a certain amount of damage has been done to hops by the mite at Agassiz, B.C.

Extensive experiments were carried out at Berkeley, Cal., in order to determine the life-history of *T. bimaculatus*. The eggs are laid singly and are not attached to the host plant by protecting webs, as are the eggs of the citrus 'red spider' (*T. mytilaspidis*, Riley), but are held by strong filaments or are to be found on the loose web which is ordinarily spun under infested leaves. The incubation period varies from 4½ to 10 days, according to temperature and general climatic conditions. Females were isolated on leaves to determine whether parthenogenesis takes place, and it was found that of 33 eggs deposited by these virgin mites all of the 26 that hatched were males.

The web, which is spun by either sex indiscriminately across the underside of the infested foliage, affords the mites much protection against wind, rain or sprays. It was proved that the 'red spider' passes the winter upon wild plants in and around the hop-fields, and the pest thrives upon nearly every form of vegetation in which the underside of the leaf is not so hairy as to prevent its attack on the leaf tissue proper. Laboratory experiments showed that *T. bimaculatus* is capable of progressing along 211 feet of hop-leaf surface in 10 hours, or 10 to 60 feet over bare soil, according to the roughness of the latter.

The mites damage the hop-vine by sucking the juices from the cells, leaving yellow spots, and lessening the vitality of the plant. This causes a premature ripening of the hops, and in severe cases makes the hop-cones brittle, weakens the roots and decreases the crop of the following year. The only probable means of distribution, other than the natural migrations, are by horses used in cultivating, or by the men, and possibly on the bodies of the larger insects found on the hop-vines.

Among the predaceous insects, which, however, have no appreciable effect upon the infestation of the 'red spider,' are *Triphleps tristicolor*, White; *Scymnus nanus*, Lec.; *S. marginicollis*, Mann.; *Pentilia* sp. and *Chrysopa californica*, Coq., the last in the larval stage being the most effective of all. The mites on hops are not affected by any form of dry sulphur, but are readily killed by several contact insecticides, the cheapest and most convenient of which are flour paste (8 : 100), or a combination of lime-sulphur, 36° Baumé (1:100) and flour paste

... 100). To get the best results the lower foliage of the vines should be stripped and the vines thoroughly and rapidly sprayed immediately afterwards. The infested area should be sprayed a second time seven or ten days later. Banding the vines with tanglefoot will check migrations, especially when the hop-fields contain many weeds. Continual spraying with water will check the mite on roses and carnations, while fine sulphur is effective on sweet peas. Pumpkins, squashes, cucumbers, violets, chrysanthemums and box-elder are easily protected by the flour paste (... 100). Instructive photographs accompany the text, and as *T. gloveri*, Banks, and *T. telarius* are probably synonymous with *T. bimaculatus*, the more important references to those species are included in the bibliography.

PARKER (W. B.). **The Hop Aphis in the Pacific Region.**—*U.S. Bureau of Entomology*, Bull. no. 111, 6th May 1913, 43 pp., 8 figs., 10 pls.

The hop aphis (*Phorodon humuli*, Schrank), known for a long time in Europe, first appeared in New York in 1863 and reached the Pacific Coast in 1890. The greatest injuries from this pest occur in California, Oregon, Washington and British Columbia. In 1911 the loss due to the aphis in two large yards in the last-named State was estimated at $80,000, and in 1912 about $124,000 worth of damage was done in Oregon. The hop aphis injures the crops in two ways: by extracting the plant juices it prevents the normal growth of the plant, and by the excretion of honey-dew, on which grows the black-smut fungus (*Cladosporium* sp.), it injures the quality of the crop. Investigations regarding the economical control of the hop aphis were carried out at Santa Rosa, Cal., and Independence, Oreg.

The winter eggs are laid by the oviparous female on buds or leaf-scars of plum, prune, sloe or hop, and hatch about the same time in the beginning of April. The insects which emerge from the sexual eggs are wingless viviparous females ('stem-mothers'). They are 1·5 to 2 mm. in length, whitish green, and the antennae are set on characteristic frontal tubercles. Being very prolific they are capable of populating several leaves in a very short time. Winged aphides appeared about a fortnight after the first wingless insects were observed. The winged aphides which mature on the plum are the first migrants, and may travel some distance when aided by a light wind. The winged form which produces the sexual female migrates in the autumn from the hop to its winter host (plum, prune or sloe).

Hop aphides are usually found on the underside of the leaves and may be observed gradually working up the vines and inside the cones. Large black ants (*Formica subsericea*, Say) were observed to carry the aphides to the newly expanded leaves, and they were so active at Santa Rosa, Cal., that it was found necessary to put tanglefoot on the vines to prevent the latter from being reinfested. It was found that a hot dry wind is very unfavourable to the aphides and may sometimes materially check infestation.

Parasites and predaceous insects destroy the hop aphides in large numbers, but do not successfully control them. *Hippodamia convergens*, Guér., *Coccinella californica*, Mannh., *C. abdominalis*, Say, and *Chilocorus orbus*, Cas., were frequently found among the aphides. The larvae of *Syrphus opinator*, O. S., and *S. americanus*, Wied., and the predaceous bug *Triphleps insidiosus*, Say, were also found. At Richfield, N.Y., *Adalia bipunctata*, L., *Stethorus punctum*, Lec., *Camptobrochis nebulosus*, Uhl., and *Anthocoris* sp. were observed attacking the pest.

The hop aphis is readily killed by several contact insecticides, *e.g.*, tobacco decoctions with whale-oil soap, and quassia chips with whale-oil soap. The formulae for such insecticides, methods of preparation and application are described in detail. The cost of spraying one acre, according to density of foliage, is $5·38 for 300 gals. and $6·79 for 500 gals. of nicotine sulphate (1 : 2,000), and flour paste (4 : 100). One application of quassia chips (8 lbs.), whale-oil soap (6 lbs.) and water (100 gals.) costs $5·65 and $7·25 per acre respectively. Proper stripping of the vines to about four feet above the ground, picking off infested leaves, irrigation, and the use of fertilisers, are valuable aids in controlling the aphis. The spraying operations must not be delayed and all the leaves of the vines must be wetted on both sides. It is more economical to waste a little material than to fail to apply enough. The more important writings on the hop aphis are referred to in a bibliography.

MacDougall (Dr. R. S.). **The Red Clover Gall Gnat, *Amblyspatha ormerodi*, sp. nov., Kieffer.**—*Jl. Board of Agriculture, London*, xx, no. 3, June 1913, pp. 225-230, 6 figs.

From November 1912 to March 1913 the Board of Agriculture and Fisheries received numerous complaints of the dying of red clover (*Trifolium pratense*), chiefly from Norfolk, Suffolk, Essex, Lincoln, Huntingdon, Cambridge, Surrey, Hereford and Shropshire. In practically all the samples received red maggots of a Cecidomyid were found, which belong to the same species mentioned by the late Miss Ormerod in her Report for 1889, and the flies bred from the maggots have been identified by Professor Kieffer as *Amblyspatha* sp. The eelworm, *Tylenchus devastatrix*, was also almost invariably found in or about the diseased plants. Enchytraeid worms, larvae of *Camptocampus aterrimus*, of *Sciara*, of *Sitones*, *Collembola* and *Sclerotinia sclerotiorum* occurred occasionally. The gall-midge maggots were found in the tap-root, at the apex of the plant, at the ground level, in some of the withered and browned side-shoots, in unopened leaflets and in unexpanded buds. Large numbers of the larvae preparing for pupation and a few pupae were found in the soil. Two other Cecidomyid enemies of clover are known in Britain, the clover leaf-midge, *Dasyneura (Cecidomyia) trifolii*, on white clover (*Trifolium repens*) and the clover seed-midge, *Dasyneura (Cecidomyia) leguminicola*, on red, white and Alsike clover. As regards the attacks by the red clover gall-gnat, the symptoms of the clover plants often resemble those due to eelworm attacks; but from

. . large numbers of the Cecidomyid larvae and their position. ... rodi must be regarded as a direct and distinct enemy of ... clover. The disease generally appears when there is an ... ant autumn growth in the plants after the corn is cut. ... was found that there is no disease on those parts of the field ... h are fed off closely by sheep, so that it would be wise to ... the clover, which grows after the harvesting of the cereal ... cut or eaten off by sheep. Badly infested plants should be ... ghed in deeply. Plants that look poor in winter may ... ver, as red clover is a hardy plant.

SHERMAN (F.). **The Meloidae (Blister-beetles) of North Carolina.**—*Entom. News, Philadelphia*, xxiv, no. 6, June 1913, pp. 245-247.

This list, which is believed to be reasonably complete, shows a total of 21 species of MELOIDAE on record in N. Carolina. *E... ta cinerea*, Först., has damaged clematis. *E. marginata* ... damages clematis, as well as egg-plant and potato, and has ... found on tomato and amaranthus. *Macrobasis unicolor*, Kirby, is not uncommon under lupins at Southern Pines. *Meloe ... sus*, Kirby, has been complained of as a pest of turnips. An undetermined species of *Meloe* has been found feeding on ... and clover. *Pomphopoea aenea*, Say, has been found ... der maple trees, and in 1903 was exceedingly abundant on ... ssoms of peach and plum, later reports stating that when ... s bloomed they left the fruit trees for the oak catkins. *P. ... icularis* swarmed in thousands at Blowing Rock (1901), ... ting the blossoms of mountain laurel (*Kalmia*) and the leaves ... peach, apparently preferring those that were affected with leaf-... *Tetraonyx 4-maculatus* is at times common on the butterfly ... and wild sweet potato (*Ipomoea pandurata*).

EVANS (W.). *Ortheziola rejdovskyi*, **Sulc., a Coccid New to Scotland, in the Forth Area.**—*Scott. Naturalist*, June 1913, pp. 142-143.

In crevices of rocks facing the sea at Archerfield Links, near Dirleton, Haddingtonshire, the author found several specimens of a Coccid, subsequently identified by Mr. E. E. Green as *Ortheziola rejdovskyi*, Sulc. This Coccid has previously been recorded only from Bohemia (1894) and from an ants' nest in Somerset (1911).

FABER (P.). **Der Heu- und Sauerwurm und seine Bekämpfung im Grossherzogtum Luxemburg.** [The Vine Moth, *Clysia ambiguella*, Hb., and its control in Luxemburg.]—*Suppl. to the Luxemburger Weinzeitung, Grevenmacher*, no. 15, 1st April 1913, 22 pp.

After reviewing the damage to vineyards in France and the Pfalz caused by *Clysia (Conchylis) ambiguella* the author estimates the loss from this pest alone to vine-growers in Luxem-

burg during the years 1904 to 1912 to amount to at least 8,750,000 francs, the total loss from all causes (frost, *Botrytis*, *Peronospora*, etc.) being four times that amount. The damage threatens to be increased by the rapid infestation by *Polychrosis botrana*, which seems to favour sunny, sheltered situations, while *Clysia* is not particular in its selection of a locality.

The value of the natural control of these pests by birds, especially by tits, swallows and starlings, has been recognised by the authorities in Luxemburg. About 2,000 nesting boxes have been placed in suitable spots near and in vineyards, and State grants are also given to encourage the planting of trees and shrubberies in wine-growing districts for the same purpose. Numerous leaflets and circulars have been distributed and lectures held to educate the rural population as to the necessity for protecting bird life.

The breeding of Ichneumonids for the purpose of destroying the vine moths has not led to the results hoped for, so that more attention has been paid to control by parasitic fungi.

The pupae of the vine moth do not seem to be affected by extreme cold, but the eggs are very sensitive to sunlight and heat, so that proper methods of cultivation ought to ensure that individual vines obtain all available sunshine. Early picking of grapes is worse than useless. Certain strains of vine are more immune against the attack of the vine moth than others, but the degree of immunity varies according to the locality in which they grow, and no known strain is universally immune.

Experiments regarding artificial control have been undertaken by the Grand-ducal Viticultural Committee. On account of its poisonous properties lead arsenate was not used, and other arsenicals did not have the desired effect after a three years' trial. Nicotine powder manufactured by an Alsatian firm likewise proved to be unsatisfactory. The 'nicotine titrée' prepared by the French Régie could not be obtained, as the French State factories were unable to manufacture a sufficient quantity even for home consumption. An equally good preparation, Everth's 10 per cent. U.S.A. tobacco extract and soft soap ($3\frac{1}{4}$ lb.), applied with Bordeaux mixture (22 gallons) proved to be extremely satisfactory in the Grevenmacher, Machtum, Ahn, Niederdonven, Wormeldingen, Ehnen and Schwebsingen districts. Provided that the vines have been carefully pruned and all superfluous shoots removed, approximately 44 gallons of this spraying mixture, at a cost of ten shillings, will suffice for an area of about 1,200 square yards. Agricultural co-operative associations and the Viticultural Committee are permitted to import the tobacco-extract duty-free, thereby effecting a saving of $6\frac{1}{2}d.$ per lb. Unfortunately the campaign against the vine moth by chemical methods is too expensive to be carried out except where skilled labour is available. It is less advisable to combine spraying against this pest, which chiefly attacks the inflorescence, with the spraying against *Peronospora*, which damages the leaves. One of the chief disadvantages of spraying is the fact that it destroys the beneficial insects at the same time. The only method which promises to be of universal

...is careful cultivation and scrupulous cleanliness in the vineyards. As a compulsory campaign has its obvious drawbacks, the Government of Luxemburg have decided to encourage voluntary co-operation in the matter, and already do so by educational methods, as well as by the free distribution of cans and sticky papers for trapping the adult moth and clean and proper material (bast, rush, &c.) for tying up the vines. A grant of ... francs has been allowed for the improvement of paths in vineyards, the lack of suitable paths being a great difficulty in clearing away litter, etc., and giving access to the vines for the purpose of collecting infested grapes. The gradual replacement of the separate stakes for each vine by a system of wire training is recommended. The sticky racquet method has been most successful in some districts where the school children were employed in gangs to clear the vineyards systematically of the moth. Committees are being formed to undertake experimental work to investigate the merits of different methods of control.

**An Aphis Season.**—*Gardeners' Chronicle, London*, 7th June 1913, p. 377.

Aphides have rarely been more destructive than they are this season. They swarm on gooseberries, black currants, plums and apples, and spraying has proved practically useless against the leaf-curling species. The only effective method of treating aphis attack on currants is to dip the infested shoots into vessels containing an insecticide.

Heikertinger (Prof. F.). *Psylliodes attenuata*, **Koch, der Hopfen oder Hanf-Erdfloh. Pt. 1.** [The Hop or Hemp Flea-beetle, *Psylliodes attenuata*, Koch.]—*Verh. der K.K. zoologisch-botanischen Ges. Wien*, lxiii, no. 1, 30th April 1913, pp. 1-25, 15 figs.

Part i. of this paper deals with the morphology and biology of the larva and pupa of *Psylliodes attenuata*, which has severely injured the hop-gardens of Saaz (Bohemia), and comparative remarks are made regarding the American hop flea-beetle, *P. punctulata*, as described by Parker and Chittenden. The author's investigations prove that *P. attenuata* produces only one generation during the year. The seeming occurrence of two generations, one in spring, and the other in summer, is due to the fact that the summer generation hibernates. Leaving its winter quarters in spring, it skeletonises the young hop-leaves, oviposits at the beginning of May and gradually dies off. The beetles hatching from these eggs make their appearance in the beginning of August and cause far more serious damage to hops by destroying the inflorescence. One of the chief factors which determine the development of the hop flea-beetle is the character of the soil. A light sandy soil in a moderately humid district is extremely favourable, as it offers the pest a suitable hibernaculum, and the larvae have greater freedom of movement; while a heavy soil, especially with a northerly exposure, hinders the

development of the larvae and pupae. The hop flea-beetle has a number of natural enemies (ground-beetles and centipedes), but they are by no means sufficient for its control. Clean methods of cultivation and the mechanical destruction of the pupae in the soil by hoeing, etc., are the best means of controlling the pest. Experiments are needed regarding the destruction of larvae and pupae by disinfecting the soil.

MORSTATT (Dr. H.). **Beobachtungen über das Auftreten von Pflanzenkrankheiten im Jahre 1912.** [Observations on the occurrence of Plant Diseases in 1912.]—*Der Pflanzer, Daressalam*, ix, no. 5, May 1913, pp. 211-224.

Fungus diseases as well as insect pests of crops in German East Africa are discussed in this paper. Cotton, on the whole, was less subject to disease than in former years, and in the Rufiji district was practically uninjured, probably owing to a careful selection of the seed. *Apion xanthostylum*, Wagn., at Amani, damaged cotton grown from Venezuelan seed by forming galls on the stems. Another species, *A. armipes*, previously recorded from Nyasaland, has been found in Western Usambara. Specimens of *Dysdercus fasciatus*, Sign., and *Calidea dregii*, Germ., were sent to the author from a cotton plantation in Usumbwa. *Dysdercus cardinalis*, *D. festivus*, *D. nigrofasciatus* and *D. superstitiosus* are also found on cotton throughout the protectorate. *Serinetha hexophthalma*, Thunb., occurred at Kibongoto and has been reported as infesting coffee. *Oxycarenus hyalinipennis* in Myombo visited Egyptian, Mitafifi and Abassi cotton previously damaged by the boll-worm, but did not attack adjacent Upland cotton. The large bug found on cotton at Tabora and recorded as *Calidea rufopicta*, Walk., has been identified by Schouteden as *C. apicalis*, Schout. Of the five species of Homoptera found on cotton at Mombo the most frequent is *Chlorita facialis*, Jac. Two species of *Lecanium* and *Pulvinaria* infested Upland cotton in Usumbwa and *Hemichionaspis minor*, Mask., occurred in Amani. *Pseudococcus perniciosus*, Newst. and Will. (*P. filamentosus*, Ckll.) was fairly frequent at Mombo and in Zanzibar.

Regarding market garden pests, a sawfly of the genus *Athalia*, closely allied to the Indian mustard sawfly, devastated mustard and radish fields. Experimentally these were twice sprayed with a 2 per cent. solution of Floria-Quassia soap containing 0·1 per cent. sodium arsenite and 1 per cent. of sugar. The application met with complete success, though the arsenite slightly burned the leaves, but subsequent rains caused a luxuriant crop. Vegetables in the Usambara and Meru districts were severely injured and a field of rape in Amani was completely defoliated by the diamond-back moth, *Plutella maculipennis*, Curt. The beetle *Mylabris difurca*, Gerst., damaged beans, cucumbers and cabbages in Usambara. The Coccinellid *Epilachna chrysomelina* perforated cucumber leaves in Nyussi and damaged *Sesamum orientale* in Lindi. *Gryllotalpa africana*, known locally as Katololo, and *Gryllus* sp. did great damage to rhubarb, papaws and other plants

gardens in Usumbwa. These pests may be destroyed by poisonous baits, consisting of a paste of flour and honey to which 1 to 2 per mille of arsenic has been added.

In Usambara a further advance of the white coffee-borer has been recorded, as well as of the Anthribid beetle, *Phloeobius* ...*atus*, but the latter insect seems only to attack diseased coffee plants. In Usambara the coffee bug did not appear in alarming numbers, while there was an increase of stinking grasshoppers, *Zonocerus elegans*.

*Ceratitis anonae*, Grah., hitherto recorded only from Ashanti and Southern Nigeria on soursop (*Anona muricata*) and guava, has been reared from cacao pods in Amani. Curiously enough the Mediterranean fruit fly, *C. capitata*, which has been damaging coffee in Uganda, has not yet appeared in German East Africa.

In the older rubber plantations at Amani the larvae of the Castilloa borer, *Inesida leprosa*, have repeatedly damaged the trees. Dying branches of *Manihot glaziorii* were infested by a species of Ambrosia beetle the larvae of which feed on a fungus growing on the walls of the burrows.

Numerous enemies of the cow-pea (Swaheli, *Kunde*), *Vigna* ...*sis*, were recorded at Amani during the year under review, the most frequent being *Apion varium* var. *vicinum*, Wagn. The cow-pea weevil *Pachymerus* (*Bruchus*) *chinensis*, L., has also been found on East African sorghum millet. *Bruchus ornatus*, Fahr., occurred at Amani on cow-peas as well as on the beans of *Dolichos lablab* introduced from India. *B. obtectus*, Say, has been imported into Amani with Californian beans and *Caryoborus* ...*omarginatus*, Chevr., in seeds of the Carnauba palm (*Copernicia cerifera*) from Brazil. Other pests of the cow-pea were *Sitotroga cerealella*, Ol., and two other moths, and a Scolytid, the presence of which has not been satisfactorily explained.

The Coccinellid, *Epilachna similis*, which has for several years been damaging maize in Aruscha, seems to be also beneficial, in that it controls scale-insects, especially *Coccus* (*Lecanium*) *viridis* on coffee, *Mytilaspis* sp. on citrus and light green aphids on cotton.

A Bostrychid resembling the Indian species, *Dinoderus distinctus*, has been damaging bamboo poles, even after an application of carbolineum. *Apate indistincta*, Murray, which is destructive to bamboo in British East Africa, has done much damage to building timber in the German Protectorate. Mahogany (*Khaya senegalensis*) has been injured by a small caterpillar causing an exudation of gum and by a beetle causing damage similar to that done by *Tragocephala pretiosa*.

**Le Pyrèthre de Dalmatie, sa Culture en Provence.** [Dalmatian Pyrethrum; its cultivation in Provence.]—*Jl. Soc. Nationale D'Horticulture de France*, xiv, May 1913, pp. 270-272.

Dr. E. Heckel of Marseilles began to experiment with the cultivation of Pyrethrum for insecticides in the year 1900 in consequence of the high price of flowers, 3*s*. 5*d*. to 3*s*. 10*d*. a lb. The experiments were made in the botanical garden at Marseilles

and in the neighbourhood of the town, and have shown that the plant lives longer and flourishes better if left to itself almost without care. The powder obtained from such flowers has been shown to be equally rich in the active principle with that grown in the East, the content being 8 per cent.; but it was found that in the case of plants which were cultivated and manured with great care the figure fell to 6 and even 5 per cent. Four lb. of fresh flowers are required to produce one lb. of the dry product. Dr. Heckel is of opinion that at present prices the cultivation might be taken up with some prospect of commercial success, and he urges the farmers of the South of France, Algeria, Tunis, and Morocco to give attention to it.

FAES (H.). **L'Acariose court-noué des Vignobles suisses.** [A mite disease in Swiss vineyards.]—*La Vie Agricole et Rurale, Paris*, ii, no. 27, 7th June 1913, pp. 14-17, 1 fig.

The author says that there are few diseases of the vine which in late years have caused so much alarm to vineyard owners as the disease which is known in France under the name of Court-Noué. It would appear that there is more than one disease which goes by this name, or that at least the effect upon the vine is the result of more than one cause. In France and Italy Ravaz and Pantanelli appear to have determined that the disease is physiological in character. In Switzerland and Austria on the other hand, especially in the vineyards close to Lake Constance, it would seem that the disease known by this name is produced by a parasite which was remarked for the first time by certain vineyard owners of Tartegnin, near Rôlle, and on the borders of the Lake of Bienne in Switzerland in the year 190[illegible]. Since that time the disease has spread with great severity through the cantons of Geneva, Vaud, Valais, Neuchâtel, Berne, and Schaffhausen, and every year it has been reported as occurring with greater or less intensity according to the nature of the weather in spring-time. The disease presents the following characters. The young shoots develop badly and the internodes are shortened; hence the name Court-Noué which has been given to it by the Swiss vine-growers. The leaves remain small, folded and crumpled, and never open in a proper manner, and the whole plant presents an aspect of more or less completely arrested growth. Where the attack is serious the shoots turn black, dry up and disappear, and a number of so-called false buds develop on the plant. The attacked wood revives as soon as the warm weather comes in, the shoots tend to resume their proper diameter and the internodes grow to their usual length, but the leaves at the base of the shoot, which were folded and crumpled, never develop properly, so that the vine presents a number of long shoots bearing these small deformed leaves. As a plant continues to grow, the upper leaves which have not been attacked develop normally in such a way that in the month of July it is generally possible to distinguish by the mode of growth of a vine whether it has or has not been attacked in the spring. The grapes do not develop: they abort or become so small that

there is very serious diminution of the crop, and sometimes no crop at all. The cause of the disease is a minute Acarid, and if at the time of trimming the diseased vines, the brown and green scales which envelop the buds, as well as the young leaves which compose them, are examined they will be found to be covered and bitten in many places by this Acarid, which was discovered by Müller-Thurgau and further observed by Lozeron, Faulat and the author. Professor A. Nalepa, of Vienna, has described this Acarid under the name of *Phyllocoptes vitis*, sp. n. In the vineyards attacked, *Phyllocoptes* is found in quantity on the very young buds, interfering with their growth in such a way that when examined under the microscope many of the cells are found to be brown and dead. The parasite emerges from the bud with the young leaves, covering both surfaces and preventing their development. They are found in great quantities in the spring-time and the author says that at the present moment (May) there are to be found specimens of all sizes and many eggs; in summer there is a fresh outbreak. Towards the end of September the parasites begin to leave the branches and withdraw to the stem. In 1905 this movement was observed to begin on the 20th September, and on the 4th October it was difficult to find isolated individuals on the leaves; by 21st October they had all disappeared, but hundreds were crowded together in the bark of the stem, having there taken up their quarters for the winter. They were especially numerous on the fragments of bark at the base of the branches. From the cracks as many as 60 or 70 could be taken at a time. On the 27th December they were still found in great numbers on the bark and again on 25th January, when apparently frost had had little or no effect upon them. The author discusses at some length the parts of the plant most affected by the parasite. Direct treatment against the pest has not yielded very good results, sulphuring at the end of July or the commencement of August is however of some use, but the best treatment is preventive, and this should be carried out immediately after pruning in February or March when the Acarids hibernating on the vine stock can be very easily destroyed. The buds are not so far developed but that they will bear without harm the use of concentrated solutions of alkaline polysulphides; a 30 per cent. solution, either sprayed or applied with a brush, gives good results, and this should be applied two or three weeks before the growth begins. It is most important that the tips of the twigs should be thoroughly wetted, as well as the buds and the whole of the part which has been cut.

PICARD (F.). **La Chenille Bourrue des Vignes et ses Maladies.** [The "Woolly Bear," *Arctia caja*, and its diseases.]—*La Vie Agricole et Rurale, Paris*, ii. no. 27, 7th June 1913, pp. 19-20.

This caterpillar is omnivorous, but has developed a serious predilection for the vine, especially in the south of France. In the Mediterranean region there are generally two broods and occasionally three, and the caterpillars

hibernate under the bark of the vine-stocks. They come out again in the spring in considerable numbers and it is at this time that they do the most harm, by eating the young buds. Pupation takes place in May, the adults emerge in June, and a second generation of caterpillars appears in June and July, but these are not much to be feared, as the vine leaves are too numerous and too tough to suffer much from their attacks, and the other plants growing between the vine-stocks provide food more to their taste. In the north of France there is rarely more than one generation, and though the number of caterpillars may occasionally be large, they never swarm as in the south. Every 3 or 4 years there are formidable invasions in the Garde, l'Aude and in Hérault, but each time an epidemic arises which decimates the caterpillars and sometimes appears to destroy them entirely.

Climatic conditions appear to have little effect upon these periodic outbreaks. In 1910, which was a year of great invasion, Braconids of the genus *Apanteles* appeared in great numbers and practically destroyed all the larvae, and this extraordinary prevalence of parasites secured freedom from the pest in 1911 and 1912. A fresh invasion, more formidable than the previous one, declared itself in the beginning of the present year, 1913, and at this time *Apanteles* was conspicuous by its absence, but the *Arctia* were destroyed almost to the same extent by two parasitic maladies; one due to a fungus, *Empusa (Entomophthora) aulicae*, which did good work during the great invasion of Hérault in 1896; and the other a bacillus, which the author has named *Coccobacillus cajae*. The latter can be cultivated with the greatest ease, especially at 25° C., on various media such as gelatine and bouillon. A caterpillar infected either by pricking one of its feet with a poisoned needle or by the introduction of a drop of the culture medium into its mouth, dies in 2 or 3 days of septicaemia. Frequently the caterpillar dies as the result of a violent diarrhoea, which is set up before the septicaemia declares itself.

The author has experimented with several insects and has found this bacillus to be fatal to *Porthesia chrysorrhea*, cockchafers, crickets, cabbage flea-beetles and others. White rats are not affected, but a few drops of the culture or an extract of an infected caterpillar will kill a green frog. The author does not explain how this remedy is to be put to practical use, but he suggests that it should prove of great value, not only against *Arctia*, but also against many other caterpillars which from time to time appear in enormous numbers in the vineyards.

**La Lutte contre la Chenille du Raisin** (*Arctia caja*, **L.**).—[The struggle against the Grape Caterpillar, *Arctia caja*, L.]—*Bull. de L'Office du Gouvernement Général de l'Algérie, Paris*, xix, no. 11, 1st June 1913, pp. 176-177.

The caterpillars of this moth are reported as having been very abundant this year in the vineyards of the South of France, and much attention has been given to methods of attacking the pest. The report contains a detailed examination of a paper by G. Catoni from "Il Coltivatore" in which the author

summarises the results he has obtained by the use of tobacco juice in the past year. The mixture employed consisted of ½ lb. of juice and 6¼ oz. of soft potash soap dissolved in 20 gals. of water. The experiments were rigorously made on an equal number of vines in the same locality and were performed under identical conditions as to the age of the vine-stocks and the mode of cultivation. The figures show that with one spraying on the 8th May or one spraying on the 17th July an increase of 61 per cent. of the yield was obtained. Two sprayings in May and two in July gave an increase of 235 per cent., and three sprayings in May followed by three in July and August gave an increase of 306 per cent. The reduction in the number of caterpillars which survived the treatment is represented respectively by the figures, 3, 2·8 and 0·95, whilst in the control plants the figure was 4. There is no doubt as to the value of the repetition of spraying. A series of figures is given for each year from 1902 to 1912 inclusive, showing the number of days on which the perfect insects of the first brood were observed on the vines. Further figures are given which show that not only the quantity of the yield was improved by the treatment, but also the quality. It would appear that there are considerable variations in the strength of the tobacco juice supplied by the Italian authorities; and Catoni also says that it is necessary that the soap should be standardised, because he has found that it occasionally produces burning of the leaves at a strength which has been previously used without harm.

Deslandes (R.) & Chalot (C.). **Culture du Citronnier à la Dominique.** [Lime cultivation in Dominica.]—*L'Agriculture pratique des Pays Chauds, Paris*, xiii, no. 121, April 1913, pp. 306-327.

The authors say that in the early days of lime cultivation in Dominica, insect pests were either of small importance or their presence was not observed, but that since the cultivation has been greatly extended, pests show themselves in serious numbers. *Lepidosaphes beckii* (*Mytilaspis citricola*) is the pest which causes the largest amount of damage and in 1902 threatened the destruction of the plantations. The only sprays which appear useful are those of soft soap and petroleum. *Chionaspis citri* is almost equally dangerous and especially attacks the trunk and main branches of the tree. It can be got rid of with comparative ease by painting the parts attacked with emulsions of soft soap, resin or petroleum, or even with milk of lime. The scale which is most feared at present is *Lecanium viride*, because its attacks are almost always accompanied by a disease known as "fumagine." Two other scale-insects, the red scale of the West Indies, *Chrysomphalus aurantii* (*Aspidiotus articulatus*), and the brown scale, *Coccus acuminatum* (*Lecanium hemisphaericum*), are found, but are not considered so dangerous as the others. The following fungi are active agents in the destruction of scale-insects:—*Sphaerostilbe coccophila*, *Myriangium duriaci* and *Cephalosporium lecanii*. The authors remark that scale-insects may exist in a plantation for

years and cause such small damage that their presence may not be noticed, but that in damp years they multiply with very great rapidity and the planter finds his trees suddenly invaded on all sides. The insects prick the leaves and cause them to exude a sweet juice on which "fumagine" at once begins to develop; the vital functions of the tree are gravely interfered with and they either die or yield practically no fruit. If it be found that the parasites cannot be kept in check by spraying, the only thing to be done is either to cut down the trees entirely or at least remove and burn all attacked branches. For this reason there is little doubt as to the advantage of plantations set out in regular lines and with considerable intervals between the trees. In the early days a great mistake was made in planting the trees too close, and in no order, which has greatly increased the risk of infection and the difficulties of combating it when it arrives. They give the following formulae for spray emulsions:

(1) Soft soap ½ lb., crude petroleum 2 gals.; the soap is dissolved in a gallon of hot water and the petroleum slowly added whilst stirring, and the stirring is stopped when the mixture has some resemblance to cream; at the moment of use it is made up to 30 gallons with water. (2) Powdered resin 4 lb., washing soda 3 lb.; these are mixed with a sufficient quantity of boiling water kept hot until combination has taken place, and made up to [illegible] gallons; at the moment of use the whole is made up to 24 gallons. The best time for spraying is that at which the trees are pruned. After this operation has been performed it is much more easy to spray the trees thoroughly than before, but in any case spraying should be commenced at once on the appearance of the scales, and the second spraying should be given 10 days after the first in order to destroy young insects which have escaped the first treatment. It is important to conduct these spraying operations in dry weather, so that the solution may adhere to the leaves of the tree. If the trunks or the larger branches of the trees are seriously attacked, they should be scraped, and one of the above emulsions subsequently laid on with a brush.

Another enemy is the lime borer, *Leptostylus praemorsus*, which sometimes causes serious damage to the trees, the larva boring its galleries into the interior of the trunk and the principal branches. In order to meet this pest, all dead branches must be cut away, as well as the bark, and burnt, and the holes should be plugged with some mixture for killing the larvae, and it is further advisable to give the trunk a protective coating of some tarry compound to prevent the insect from laying its eggs upon it. The attack of these borers is said to be most severe in moist heavy soils, while the trees in light soil do not suffer so much.

**Root Borers and other Grubs in West Indian Soils.**—*Agric. News, Barbados*, xii, no. 287, 26th April 1913, pp. 138-139.

In Barbados the larvae of *Phytalus smithi* are found in the soil of cane-fields, gardens and plant tubs. During one night 500 to 600 of the beetles were captured on roses and other garden

plants near Bridgetown, in May 1910. They are not considered to cause any serious damage, possibly because the grubs are largely parasitised by a Scoliid wasp, *Tiphia parallela*. Little would have been known of this insect and its parasites in Barbados, even at the present time, but for the fact that its grubs occur in the same fields as the root borer (*Diaprepes*). *P. smithi* is a root trimmer rather than a root borer. The larvae feed on small roots and are often to be found in greatest numbers in the middle of the banks rather than in the cane holes. *Lachnosterna patruelis* is known to occur in St. Kitts and Dominica, and has so far only been found in the soil of the cane-fields and other cultivated lands. Its larvae have probably long been confused with those of *Ligyrus tumulosus*. The amount of injury done by this insect is not known. It appears to be parasitised by the same Scoliid wasp as *Phytalus smithi*, and also by another, *Elis atrata*, which is a parasite of an injurious weevil, *Exophthalmus vittatus*, in Jamaica.

**Root Borers and other Grubs in West Indian Soils.**—*Agric. News, Barbados*, xii, no. 288, 10th May 1913, pp. 154-155.

For several years past species of *Lachnosterna* have caused great damage to sugar-cane and to onions in Antigua, and in Feb. 1913 a serious attack on maize was reported. The May beetle or "Caculo" is reported as having done considerable damage to the sugar-cane roots in Porto Rico and two further species of the subfamily MELOLONTHINAE have been collected from the cane-fields; also 3 Dynastids, and in one district a large rhinoceros beetle is said to do far more damage to the cane than the common May beetle. The larvae of *Lachnosterna* also attack the roots of young orange trees and of several grasses. *L. patens* occurs in St. Vincent. Only the adult form is known, which feeds on the leaves of cacao and other plants. *Ligyrus tumulosus* (the common "hard-back") is mostly widely distributed species in the West Indies and probably the most generally known of all beetles in these islands. The larvae live in decaying vegetable matter, such as megass, dead leaves and pen manure. It is regarded as unlikely that they feed on roots, at least under ordinary circumstances. A related species, *Ligyrus rugiceps*, is known as the sugar-cane beetle in the United States. It is in the adult condition that this insect is injurious, for the beetle eats out cavities in the underground stem of the cane. A related insect *Dyscinetus barbatus* is reported to have similar habits in Antigua, Barbuda and St. Kitts. The principal natural enemy of the common hard-back in Barbados and other islands is the digger wasp, *Dielis dorsata*. The banana root grub of Dominica and St. Lucia, *Ligyrus ebenus* (*Tomarus bituberculatus*), is probably normally a scavenger, but it has on several occasions been found to cause serious injury to newly planted banana suckers, destroying the young roots and tunnelling into the soft base of the sucker. Plantains, tannias, yams and the roots of young cacao plants are also attacked.

**Root Borers and other Grubs in West Indian Soils.**—*Agric. News Barbados*, xii, no. 289, 24th May 1913, pp. 170-171.

The rhinoceros beetle of St. Croix and Jamaica, *Strategus titanus*, was first reported in 1912 by Dr. L. Smith, Superintendent of Agriculture, St. Croix (Danish West Indies), as a sugar-cane pest, but it appears to have been known in the island since 1871. The grubs eat the roots of sugar-canes, sweet potatoes and other plants. They tunnel at the base of the stools and eat their way up into the stalks of the cane. In the case of young plants the eyes and the young roots are eaten off and the grubs often tunnel into the interior of the cuttings used for planting, resulting in the germination of not more than 20 per cent. in certain fields. The grubs are most abundant in August, and many adult beetles are to be seen in September. The fields in which the attacks have been most severe were manured with farmyard manure, largely made up from megass. Examination of megass heaps revealed the presence of the insect and also of the common hard-back, *Ligyrus tumulosus*, in considerable numbers.

Dr. Smith has tried a poisoned bait made from 100 lb. of megass and 3 lb. Paris green; a handful to be placed in a hole made with a drill alongside each plant. The insect is recorded from Jamaica as being found in the dead wood of an orange tree, and it has also been reported from the Virgin Islands. The same beetle or a related species is said to have caused more injury to the canes than *Lachnosterna* in a limited area in Porto Rico. The Rhinoceros beetle of coconut palms in Trinidad, *Strategus aloeus*, occasionally attacks canes. The attack of the adult *Strategus* on coconuts seems to be like that of the adult *Ligyrus ebenus* (*Tomarus bituberculatus*) on banana suckers, while its attacks in the larval stage on sugar-cane rather resemble those of the larvae of *S. titanus* in St. Croix. Five other species of hard-backs of the family DYNASTIDAE are known in the Lesser Antilles; these are: *Cyclocephala tridentata* in Dominica and St. Lucia, *C. dimidiata* from Grenada, feeding on the flowers and flower buds of cotton, and *C. vincentiae* in St. Vincent, and 2 species of *Leucothyreus*, one occurring in St. Vincent and one in St. Lucia, the adults of which feed on the leaves of plants, especially cacao and cotton.

The natural enemies of the adults of these insects are birds, lizards and toads. The hard-backs hide in the soil during the day, coming out at night, when the toads capture large numbers. The check cannot however be of very material consequence.

The larvae are ordinarily protected from the attacks of these enemies, but if the land be well stirred and turned over, large numbers of the grubs are destroyed. The most efficient control is the natural parasite, chiefly the Scoliid wasp, *Tiphia parallela*. Some of the other burrowing wasps are also known to attack grubs in the soil.

**Root Borers and other Grubs in West Indian Soils.**—*Agric. News, Barbados*, xii, no. 290, 7th June 1913, pp. 186.

The information concerning these insects which has already been published is here summarised in tabular form, showing their distribution, the habits of the larva and the adult, and the names of parasites where known.

Bradley (J. C.). **The Siricidae of North America.**—*Jl. of Entomology and Zoology, Claremont, Cal.*, v, March 1913, pp. 1-30, 5 pls.

A revision of the North American sawflies of the family Siricidae, which are divided into two subfamilies: Siricinae, containing the genera *Sirex*, *Urocerus* and *Xeris*; and Tremicinae, embracing *Tremex* and *Teredon*.

Noël (P.). **La Cochenille oblongue** (*Lecanium cymbiforme*). [The oblong Scale, *Lecanium cymbiforme*.] *Bull. Lab. Rég. Entom. Agric., Rouen*, 1913, pt. 3, pp. 3-4.

The author gives a resumé of a paper by H. Kehrig in the Bull. Soc. d'Études et de Vulgarisation de la Zoologie Agricole. He says that the vineyards of the South of France are being more and more attacked by the scale-insect, *Lecanium cymbiforme*. Mating takes place at the end of April and the beginning of May, according to temperature. The scales formed by the body of the female, which are fixed to the shoot and sometimes to the stock itself, are often so abundant that they touch one another and frequently cover the wood almost entirely. When fully developed in June the scales are 5-8 mm. long by 3-5 mm. wide. In winter, after pruning, the woody parts of the vine-stock are thoroughly brushed with a stiff brush charged with some caustic mixture; the author says that the only efficacious remedy against this pest is the use of good stone lime made into a thick cream, something like mortar, and laid on vigorously with a brush. When the lime dries it peels off and brings the scales with it. The lime should be used as hot as possible and the strokes of the brush should be from below upwards so as to avoid damage to buds. Kehrig gives the following recipe. Take 40 kgs. (88 lbs.) of stone lime, sprinkle it lightly with water at intervals, using the smallest quantity possible, not more than 10 litres (17½ pints), so that it falls into powder. When this operation is completed and whilst the lime is still hot pour on to it 10-20 kgs. of heavy oil, stirring the mixture until the lime has thoroughly absorbed the oil and the resulting material is a grey powder somewhat resembling cement. This operation will take an hour. The resulting powder is then carefully mixed with 190 litres of water.

It should not be prepared more than 2 days beforehand, should be well stirred when in use, and should only be applied in dry weather. One advantage of lime is that it can be seen rapidly on inspection whether the work has been properly done or no.

NOEL (P.). **Les ennemis de l'echalote.** [The enemies of the Shalot.]—*Bull. Lab. Rég. Entom. Agric., Rouen*, 1913, pt. 3, pp. 4-5.

The author says that up to the present the only known insect enemy of the shalot is the larva of *Anthomyia platura*, Mg., which eats the bulbs and causes them to become soft in the spring.

NOEL (P.). **Les ennemis de la chicorée** (*Cichorium*). [The enemies of Chicory.]—*Bull. Lab. Rég. Entom. Agric., Rouen*, 1913, pt. 3, pp. 5-6.

The number of cultivated varieties of chicory is large. They are almost all indigenous to the New World, except endives, which come either from China or Japan. The author gives the following list of insect pests of the varieties of this plant.

COLEOPTERA: *Rhizotrogus aestivalis*, eats the roots. *Pentodon punctatus*, Villers, eats the main root in the South of France. *Lacon murinus*, L., eats the roots. *Agriotes segetis*, Bjerk., also eats the roots. *Mordella aculeata*, L.; the perfect insect damages the flowers in May. *Cassida sanguinolenta*, Mill.; the larva eats the leaves in June.

THYSANOPTERA: *Thrips physapus*, Hal., sucks the juice of the stalks and petioles.

ORTHOPTERA: *Gryllotalpa vulgaris*, L., eats the roots and uproots young seedlings.

RHYNCHOTA: *Aphis pieridis*, L., causes the flowers and seeds to abort. *A. cichorii* sucks the leaves and fouls them for use as salad in June. *A. intibi*, Kock, sucks the juice of the stalks of the seed-plant. *A. radicum*, Kirby, by thrusting its beak into the roots to obtain the juice, causes the leaves to turn yellow. *Capsus saltator*, Hhn., sucks the juice of the stalks and petioles in June.

HYMENOPTERA: *Aulax* sp. causes excrescences on the roots as large as a fowl's egg.

LEPIDOPTERA: *Cucullia lucifuga*, Schiff.: the larva eats the leaves in August. *C. lactucae*, Schiff.: the larva eats the leaves in July and September. *Polia flavicincta*, Hb.: the larva eats the leaves in May and June. *Agrotis plecta*, L.: the larva eats the leaves in autumn. *Chloridea (Heliothis) dipsacea*, Hb.: the larva eats the leaves in May, June, August and September. *Hyphoraia testudinaria*, Fourc. (*Arctia curialis*, Esp.): the larva eats the leaves in April and May.

N...(P.). **Les ennemis des Radis.** [The Enemies of Radishes.] *Bull. Lab. Rég. Entom. Agric., Rouen*, 1913, pt. 3, pp. 15-16.

Radishes can be grown in France for 11 months of the year ...proper care and skill be used. The author gives the following ...of insect pests.

COLEOPTERA: *Ceuthorrhynchus boraginis*, F.: noted as a pest ...Kaltenbach. *C. assimilis*, Payk., perforates the pods and ...s the seeds. *C. pleurostigma*, Marsh., causes galls on the ... *Phyllotreta nemorum*, L., makes innumerable small holes ...e leaves. *Psylliodes chrysocephala* makes holes in the ...es.

RHYNCHOTA: *Aphis erysimi*, Kalt., sucks the stalks of the seed-...ts. *A. brassicae* sucks the stalks, petioles and leaves.

HYMENOPTERA: *Athalia spinarum*: the larvae frequently eat the ...es entirely in the spring and again in August and October.

LEPIDOPTERA: *Pieris brassicae*, L.: the larva eats the leaves in ...e, July and August. *P. rapae*, L.: the larva eats the leaves ...the year round. *P. napi*, L.: the larva also eats the leaves ...the year round. *P. daplidice*, L.: the larva eats the leaves ...June and September. *Botys margaritalis*, Hb.: the larva eats ...leaves in September.

DIPTERA: *Anthomyia floralis*, Mg.: according to Bouché this ...a attacks the plants in July. *Dasyneura raphanistri*, Kieff., ...s swellings of the buds. *Diplosine* sp. causes swellings of ...pods.

B...ot (H. A.). **Notes on Insect Pests in Antigua.**—*Bull. Entom. Research*, iv, pt. 1, May 1913, pp. 61-65, 2 pls.

The principal object of the author's visit to Antigua in Decem-... 1912 was to study an outbreak of the twig-borer of limes. ...e attack of the insect apparently always begins on a small ...g, and the larva then eats its way into the branch from which ...e twig springs. This branch is always more or less girdled ...the tunnel of the grub, and the entire life-cycle is passed ...in the outer dead portion, though it seems probable that the ...st begins to feed on living wood. The branch soon breaks, ...d the injury is so conspicuous that it is quite easy to cut ...and burn the affected twigs. The author thinks that this ...tice would so far reduce the numbers of the insect that it ...ld no longer be a pest, although it might at first cause some ...l loss and damage to the trees.

The habits of the twig-borer are different from those of the ...borer (*Leptostylus praemorsus*), which has at times been ...tiful in Dominica and is known to occur in several other ...nds. This insect lives entirely under the bark, the attack ...erally beginning near a point of injury, caused by bad prun-...g or otherwise, and as a rule on the larger branches or main ...em and often near the level of the ground. The twig-borer ...rks higher up the tree, rarely attacking branches more than ...inch in diameter. In several localities the orange-red scale

or California red scale (*Chrysomphalus (Aspidiotus) aurantii*) was found to be present in such numbers that young lime trees were being killed by it, and it was also causing serious injury to old trees. The author notes that the scales generally attack the lime fruits before the attack on the leaves and branches is serious enough to attract the attention of a casual observer. He thinks that this scale develops much more rapidly under dry than under moist conditions. The lime fruits split open and are spoilt, and the author believes this insect to be the cause of the most serious injury from which the limes are suffering.

He agrees with the general experience of cultivators that limes overgrown with creepers are generally free from scale, even though grown close to badly attacked and unhealthy trees. Wherever red scale was abundant in Antigua two Coccinellids were present in quantity, namely, *Cycloneda sanguinea* and another minute black or bluish black species, not larger than a pin's head.

The author took the opportunity of examining cotton for the flower-bud maggot, but none was found, though it was reported soon after his departure. The boll-worm has done considerable damage and the author suggests sending children into the fields to collect all attacked bolls, and that these should be destroyed by being turned into the cattle pens. He further suggests the planting of corn through the field as a trap crop.

Cassava was found to be attacked by the larvae of the common Sphingid moth, *Dilophonota ello*. These larvae are dimorphic, being either green or purple, and it has been found that they remain so until fully grown. Cassava was also attacked by a lace-bug (*Corythuca* sp.), and sweet potatoes by the larvae of a butterfly, probably *Precis lavinia zonalis*, Feld., the only species of the genus known as yet from Antigua. Cow-peas were attacked by a boring larva in exactly the same manner as those found in Barbados in 1911 from which a new species of moth was reared. A predaceous bug (*Zelus rubidus*) was also observed in large numbers on those plants attacked by the woolly pyrol moth (*Thermesia gemmatalis*).

NEWSTEAD (Prof. R.). **Notes on Scale-insects (Coccidae). Pt. I.** *Bull. of Entom. Research*, iv, pt. 1, May 1913, pp. 67-81.

The Coccids described in this paper are chiefly from Uganda and Zanzibar, seven of them being new species. *Icerya purchasi*, Mask., and *Lepidosaphes beckii*, Newm., are recorded from citrus trees in Zanzibar, this being a new locality for the former; *Pseudococcus obtusus*, Newst., from mango in Zanzibar; *Ceroplastes ugandae*, Newst., *Saissetia nigra*, Nietn., and *Aspidiotus gowdeyi*, sp. nov., from *Anona muricata*, in Uganda; and *Leucaspis riccae*, Targ., from olives, in Egypt, whence it has not been previously recorded. It is noted that all the specimens of *Saissetia oleae*, Bern., received from an unnamed indigenous tree in Uganda had been attacked by Chalcidid parasites.

WATERHOUSE (C. O.). **On a new species of Mymaridae from Trinidad.**—*Bull. Entom. Research*, iv, pt. 1, May 1913, p. 87.

The author describes a new species of MYMARIDAE, *Anagrus* *...lus*, forwarded to the Imperial Bureau of Entomology by Mr. P. L. Guppy, Assistant Entomologist to the Board of Agriculture, Trinidad, who bred it from eggs of the corn leaf-hopper *...rinus (Delphax) maidis*.

SCHNEIDER-ORELLI (O.). **Untersuchungen über den pilzzüchtenden Obstbaumborkenkäfer** *Xyleborus (Anisandrus) dispar* **und seinen Nährpilz.** [Investigations on the fungus-growing Scolytid *Xyleborus (Anisandrus) dispar* and its symbiotic fungus.] *Centralbl. Bakter., Paras. & Infekt.*, 2. Abt., xxxviii, no. 1-6, 1913, pp. 25-110, 7 figs., 3 pls.

This paper is a critical and detailed study of the bionomics of *Xyleborus dispar* and contains the results of numerous experiments regarding the feeding habits of this orchard pest. In contrast with the great number of different bark-beetles infesting forest trees, only four species of *Scolytidae* are injurious to fruit trees in Central Europe:—*Scolytus pruni* and *S. rugulosus*, belonging to the physiological group of 'bark breeders' or, according to Nüsslin, to the subfamily ECCOPTOGASTERINAE, and *Xyleborus saxeseni* and *X. dispar* to the 'wood-breeders' or XYLEBORINAE. A comparison of the mouth-parts of the adults and larvae of the latter species shows that the adults are provided with more powerful biting organs than the larvae, which corresponds with the fact that the adults alone do damage by boring, whereas the larvae browse on the fungi covering the walls of the burrows. Some excellent photographs are given showing the mouthparts of larvae and adults of *X. dispar* and *S. pruni*, and the pattern of the excavations made by the four species of Scolytid orchard pests. The difference in the feeding habits of the adult and larval *X. dispar* corresponds with differences in the structure of the alimentary system, the most conspicuous being the absence, in the larvae, of a gizzard. In discussing the structure of the female genital organs the author records the deposition of ova fertilised by spermatozoa that had been retained in the receptaculum seminis for more than six months after copulation.

If, during the winter, the burrows of *X. dispar* are carefully opened they reveal the hibernating females and males all lying one behind the other with their heads directed to the inner part of the burrow. No eggs, larvae or pupae are to be found. The fertilised females usually leave their hibernacula in April and May, and start making a new burrow elsewhere. The males are incapable of flying, and contrary to H. B. Hubbard, the author is unable to confirm the existence of 'bachelor colonies,' or the assertion that the males are liable to be suffocated by the rapidly growing fungus investing the walls of the burrows. The period of the migration of the females may extend to more than two

months, according to climatic conditions; in Switzerland t foundation of the new colony may take place at such interv to suggest the occurrence of a second generation in one ye The author did not succeed in determining the time taken any particular migration from tree to tree, but under labo conditions the infestation of a new tree takes place the sa day that the tree of hibernation is abandoned. Freque several females were observed to migrate at the time time settle on the same tree. The earliest date on which the mig tion takes place is on April 19th. In May 1912 some female *X. dispar* were caught in a vineyard in a trap intended for v moths, and as no Scolytids had ever been previously found the vines it was evident that they had come from an orch several hundred metres away. The fresh bore-holes are eas perceived owing to the white frass that trickles down the of the tree. The female does not wait till the system of tun is completed, but oviposits as soon as one horizontal burrow one vertical branch has been tunnelled out. The lateral tun containing the eggs is temporarily closed by a wad of damp fr which induces the hygroscopic conditions favourable to luxuriant growth of nutrient fungus. The earliest date on wh eggs were found by the author was May 10th, but the majo are laid in the second half of that month, and tunnelling ce entirely in the beginning of June. The eggs are usually in clusters of six, chiefly at junctions of the tunnel-system, only rarely are they to be found in one of the blind branch The number of eggs laid by a single female seems to dep on the nature of the wood, varying from 6 to 45. They ha a few days after, so that the first-made tunnels may conta larvae long before the mother has finished her burrowing oper tions. The pupal stage lasts from 10 to 14 days and the you beetles winter in the tunnels. The mother is generally dead the autumn. Notwithstanding the small number of males, the females are fertilised by the autumn, and as copulation co tinues in spring to the time of migration of the females, th author concludes that the latter receive the spermatozoa storage in the receptaculum seminis more than once. In discu ing the number of generations in one year the author critic previous observers and maintains that, without exception, least in Switzerland, only one generation occurs.

The chapter devoted to the symbiosis of *Xyleborus dispar* a its food-fungus *Monilia candida* (pp. 52-85) deals with t author's experiments on the propagation of the fungus, a di cussion of the systematic position of the latter and a comparis with other fungus-growing insects. During the greater par the year the walls of the tunnels of *X. dispar* are black, as charred, which never occurs in those of the 'bark-breeders Soon after the mother-beetle has finished burrowing, the walls the tunnels, with the exception of 2 to 3 mm. near the outer ope ing, become covered with a growth of a fungus differing fr that of *X. saxeseni*, and the beetle removes the wad of fras mentioned above, as soon as the fungus is in a satisfactory stat for the larvae. Although other species of fungi occur, th

...tic fungus preponderates to such an extent as practically ...stitute a pure culture. By his numerous experiments the ... is forced to the conclusion that the mother-beetle always ... a supply of living fungus spores in her gizzard, which are ...ed for nourishment and which may remain undigested and ... of germination for more than $2\frac{1}{2}$ months. The spores ... be taken into the alimentary canal by the adult beetle ... migration, and thus spread to the new home.

After a lengthy and detailed discussion of the predisposition ... trees to attacks of *X. dispar*, the author emphasises the ... that he has never yet found an infested tree that did not ... other primary injuries or disease, *e.g.*, wounds, roots ...ed by mice, pruning, effects of frost. All influences sapping ... vitality of the tree, even if only temporarily, such as root ... other pruning, renders it more liable to the attacks of the ...-by attacks being meant colonisation. It is the horizontal ...s of *X. dispar* which prevent the upper parts of the tree ... receiving sufficient water and nourishment and so cause it ... dry up. Epidemics generally last for two or three years. Additional damage is done to the trees by the fungus, which, ... circulating through them, causes their death within a few ...

The methods of controlling the pest are many. It is advisable ... destroy the mice that gnaw the roots of the fruit trees, to ... strains that are resistant against frost, to avoid accidental ...sions and other injuries and, what the author found to be an ...tive preventive measure, to leave a few twigs unpruned in ... to regulate the flow of the sap. Trees pruned in this ...ner are far less liable to attacks from *X. dispar* and recover ... rapidly from the effects of pruning. The painting of trees ... carbolineum, so far from preventing the beetle from colonis... often weakens the tree and has the opposite result to that ...ed. At the Swiss Experimental Station in Wadenswil it ... found that the cheapest and most effective way to protect ... fruit trees from the ravages of the beetles is to wrap the ...k and main branches with cloth or sacking. The method ...ed against Scolytids by foresters of placing upright poles in the ... as decoys, might be used against *X. dispar*. Perhaps ... such as are used for catching vine-moths might be used ... some advantage. Trees already infested are best treated by ...ting paraffin oil or carbon bisulphide into the bore-holes (the ... being the more effective insecticide), and by closing up the ...ces with clay, tar or wax. Paraffin oil kills the beetles ... the periphery: whereas a wad of cotton-wool dipped in ... bisulphide and introduced into the opening, wrapped ... a piece of wire or a match, has the effect of killing off the ...tles, larvae and pupae in the interior. Moribund trees ought ... be used as firewood and care taken to sweep up and burn all ... and litter after chopping up the wood.

Some very clear micrographs of the symbiotic fungus are shown ... the plates, and the memoir contains copious references to other ... on the subject. The author gives a résumé of known ... with regard to fungus-cultivating insects.

SMITH (R. I.). **Report of Work on Corn Bill-Bug** (*Sphenoph callosus*).—*35th Ann. Rep. of the North Carolina Ag. Expt. Sta.*, 1911-1912. *Raleigh, N.C.*, 1913, pp. 105-1..

During the spring of 1910 corn bill-bugs were reported doing an unusual amount of damage in Camden and other ... counties. Further damage was observed in June, 1910, in ... fields and in a rice-field in Columbus and Robeson count... During July and August, bill-bugs were found breeding ... Elegant Nutgrass (*Cyperus flavicomus*). A careful study of the seasonal life-history revealed that eggs are first laid about ... May on corn plants or the larger species of *Cyperus* and possi... on other sedges. The eggs require an average of six days ... hatching, and egg-laying continues until the latter part ... September. The larvae feed in the stalk or root of the pl... and become full-grown in an average period of about 33 d... Larvae of all ages occur from June until the end of Novemb... but the majority are full-grown before 1st November. The pup... are found in cells in the stalk of the food-plant or in the ... underneath the roots. Nine days is the average duration of ... pupal stage. The beetles mature and usually emerge and ... from the beginning of July until the beginning of Novemb... These beetles frequently do not mate and lay eggs until ... following spring, after emerging from their winter quarters ... the soil or under litter or, occasionally, in the corn-stalks.

SMITH (R. I.). **Biological Record of Little Grass Bill-Bug** (*Spho... phorus parvulus*).—*35th Ann. Rep. of the North Car... Agric. Exper. Sta.*, 1911-1912. *Raleigh, N.C.*, 1913, ... 136-140.

The little grass bill-bug is not a serious pest in North Carol... though it may do more damage than is supposed. In May 191... one fertile female was found in a cornfield and confined ... jelly glass where it was fed on sections of green corn-sta... Between 19th May and 7th October 245 eggs were laid, and sev... eggs was the greatest number laid in any 24 hour period. The average incubation period during warm summer weather is ... days, or about the same time required for eggs of *Sphenoph... callosus*. During the cooler weather prevailing at the end ... September, some eggs required 11 days to hatch. The lar... immediately after hatching were carefully placed on a corn-st... and the larval stage for seven specimens recorded varied fr... 31 to 60 days under what are practically field conditions. The pupal stage undoubtedly requires nine days, depending somew... on heat and moisture conditions. Four adult beetles were rea... from eggs, and one of the beetles commenced to lay eggs fo... second generation in the same year. Over 15 larvae were re... to partial maturity but died before pupation because of defi... food, which suggests that a second generation may occur un... suitable conditions.

**Work Connected with Insect and Fungus Pests and their Control.**—*Report of the Botanic Station and Experiment Plots, Antigua, 1911-1912, Barbados,* 1913, pp. 22-23.

For the first time on record, a specimen of the sugar-cane root-borer was found in Antigua, by Mr. H. A. Ballou, Entomologist of the Imperial Department of Agriculture for the West Indies. 'Hard-backs' [Lamellicorn beetles] attacked young cane directly, while in Porto Rico they are reported to be root-trimmers. The term brown hard-back, as used in Antigua, probably includes more than one species. The brown hard-back in Barbados is *Phytalus smithi*; that in St. Kitts is *Lachnosterna patruelis*. The difficulty now experienced by planters in establishing sugar-cane on some of the heavy lands of Antigua may possibly be due to the hard-back. Vaporite has been tried as a means of control, but the insect is only found after a depth of over nine inches is reached. Carbon bisulphide would probably kill the grubs, but the cost is too high for practical purposes. Slight damage was done to sugar-cane by caterpillars of *Diatraea saccharalis* which is responsible for what is known locally as 'dead hearts.'

The flower-bud maggot (*Contarinia gossypii*) appeared on cotton in Antigua during the latter end of November and disappeared during March. The early planting of the crop, so that it is beyond the flowering stage when the pest appears, is the only method of combating it. Several severe attacks of *Alabama argillacea* were experienced which were controlled with Paris green. Some weevils [*Lachnopus*], which have not been identified, did a fair amount of damage by nibbling the young growth of cotton, but were kept under control by the application of Paris green and by collecting the weevils in kerosene and water. The leaf-blister mite (*Eriophyes gossypii*) was common during the latter end of the season, but did little damage. Various other pests occurred but did not assume serious proportions.

The lime scale-insects are kept in check during good seasons by the red-headed fungus (*Sphaerostilbe coccophila*), the shield-scale fungus (*Cephalosporium lecanii*), and the black fungus *Myriangium duriaei*). In addition there are probably numerous insects parasitic on scales. The artificial introduction of the black fungus is the subject of investigations, which are being continued. It is generally acknowledged by planters in Antigua that good cultivation and liberal manuring do more for the control of scale-insects, by keeping the lime-trees in good health, than the application of insecticides.

Coconuts have been attacked by *Aspidiotus destructor*, but so far it has not been found necessary to apply any remedy.

The onion crop always suffers from attacks by caterpillars, which are controlled by stomach poisons. A remedy has yet to be found for the Jacob, *Euscepes (Cryptorhynchus) batatae*, of sweet potatoes. Cacao is attacked by Thrips occasionally, but on account of the smallness of the area grown, little notice is taken of it. As in the case of most West Indian islands, Antigua possesses a Plant Protection Ordinance.

WATSON (J. R.). **Spraying Tomatoes for Thrips.**—*Univ. Fl[illegible] Agric. Expt. Station*, Report for 1912, March 191[illegible], [illegible] lxi-lxii.

These experiments were made at Pompano. The wet weath[illegible] appeared to have interfered with the growth of the plants [illegible] the fruit was not setting. The majority of the blossoms [illegible] yellow and when touched dropped off, separating at the [illegible] half an inch below the blossom. When these yellow blossom[illegible] were opened they were found to be infested by numerous *Eut[illegible] tritici*. If only one or two were present the damage was genera[illegible] confined to the anthers, but if there were a half dozen or m[illegible] insects in a single blossom the pistil and especially the stig[illegible] was usually attacked. Eggs were found in the style and in th[illegible] pedicel. The average number of Thrips found in 15 bloss[illegible] was eight and they were not as numerous in the freshly ope[illegible] blossoms as in the older ones; there seems little room for doub[illegible] that the Thrips were responsible for the dropping of the flowe[illegible]. A trial strip was sprayed with the following mixture: Co[illegible] mercial lime-sulphur (33° Baumé), 5¼ gallons; 'Black-leaf 40' 14 fluid ounces; water, 200 gallons. It was estimated that 7[illegible] per cent. of the Thrips were killed by this spray.

WATSON (J. R.). **Insect Pests of the Year.**—*Univ. Florida Ag[illegible] Expt. Station*, Report for 1912, March 1913, pp. lxii-lx[illegible].

A severe outbreak of *Alabama argillacea* occurred all over t[illegible] Southern States and the adult moths reached as far north [illegible] New York, Massachusetts, and even Canada. The cotton [illegible] the whole cotton-growing region was almost entirely defoliat[illegible] The bean leaf-roller (*Eudamus proteus*) was abundant [illegible] destructive, as also was the velvet bean caterpillar (*Antic[illegible] gemmatilis*). The pumpkin bug (*Nezara hilaris*) was trouble[illegible] during the autumn and caused severe damage in some or[illegible] groves. *Icerya purchasi* has been found in Tampa and speci[illegible] were received from Arcadia, Knights and Haines City. Th[illegible] the first occurrence of this pest outside of the St. Petersb[illegible] sub-peninsula: it appears to be slowly spreading, but has [illegible] yet produced any severe outbreak. The boll weevil (*Anthon[illegible] grandis*) reached Florida in the autumn of 1911; specimens [illegible] received from Escambia County and it was reported from Sa[illegible] Rosa County. The fall army-worm (*Laphygma frugiperda*) w[illegible] reported as being very serious in Gadsden and Walton Count[illegible] The melon and pickle worms (*Diaphania hyalinata* and *D. [illegible] dalis*) did a large amount of damage in Alachua County [illegible] in other parts of the State. Corn bill-bugs (*Sphenophorus*) were received from Greenville where they were reported to be do[illegible] much damage. Specimens of velvet beans which failed to ripe[illegible] before frost were found to be infested with larvae, which prove[illegible] to be those of an Anthribid, *Brachytarsus variegatus*. This [illegible] interesting as being the first information on the food of the larva[illegible]

... species, so far as known to the author. Most species of ... *...tarsus* feed on scale-insects, although they sometimes feed ... seeds. They have not been observed to attack ripe velvet ... Specimens of the mango scale (*Pulvinaria psidii*), which was introduced into Florida several years ago, were received from Buena Vista.

BENTLEY (G. M.). **The San José Scale in Tennessee, with Methods for its Control.**—*Tennessee State Board of Entomology, Knoxville*, Bull. no. 8 (ii. no. 1), 24 pp., 21 figs.

In Tennessee the San José Scale first made its appearance in the eastern part of the State at Harriman, Roane Co., where it was brought in on nursery trees during 1891 or 1892, yet it was not discovered until 1896. The following year it was found in Claiborne Co.; in 1898 in Washington Co. An annual inspection of all the nurseries of the State is made and when scale is found the infested tree is pulled up and burned. In bad cases the nursery is moved, in others spraying is recommended. A further precaution is that all trees, buds, grafts or cuttings of fruit trees to be sold in the State of Tennessee must be fumigated with hydrocyanic acid gas immediately before shipment or delivery. After dealing with the habits and life-history of the San José Scale, its parasites and other enemies, the author discusses spraying and fumigating methods. Amongst other precautions to be taken when spraying with lime-sulphur solution, it is advisable for the operator to smear vaseline upon the face and hands and to use a pair of oil- or tar-soaked cotton gloves and to be careful that there are no leaks in the nozzle or hose. Spraying should only be done when the tree is dormant. The bulletin contains a diagram of a simple steam boiling outfit for preparing lime-sulphur washes. The quicklime and sulphur mixture (7 : 6), contained in four barrels placed on a platform ... feet above ground, is boiled by forcing steam into these barrels through vertical pipes ending in perforated cross-arms and connected at their upper ends with a horizontal main pipe from the boiler. Each steam-pipe leading into a barrel is provided with a ... valve, and each barrel has a pipe (with valve) for drawing off the mixture after boiling. These latter communicate with a ... pipe carrying the liquid to the waggon-tank or spray barrels.

BENTLEY (G. M.). **Eighth Annual Report (i. no. 4) of the State Entomologist and Plant Pathologist for 1912.**—*Tennessee State Board of Entomology, Knoxville*, 1913, 64 pp., 9 figs., 4 maps.

The estimated loss in Tennessee from insects destroying crops is as follows:—Corn $5,558,300; wheat $794,900; barley $7,600; rye $22,400; buckwheat $3,800; oats $307,100; hay and forage crops $1,261,800; tobacco $530,145; nursery stock $104,200; strawberries $83,579; orchards $345,900; grapes $1,404; forest and timber products $851,500.

For the first time in Tennessee the strawberry root-louse (*Ap*... *forbesi*, Weed) has been discovered doing appreciable damage ... the strawberry plants. A map shows the infested localities ... in the Lauderdale, Gibson, Weakley, Henry, Davidson, Hamil... Rhea, Blount and Jefferson Counties. Because of the small... of this aphis and its resemblance to other plant lice, little not... has been taken of the pest, which has doubtless, in small numbers, occurred in the State for some years. The aphis passes the winter in the egg stage in probably all parts of the State, and as ... adult in some localities. The very small shiny black eggs are deposited on the stems and leaf-ribs of the strawberry, and ha... in March or April. The young feed for a time on the lea... and later on seek the more tender leaves at the crown. In ab... 15 days they are mature and begin to produce from 15 to ... apterous young, which are distributed by their attendant an... This second generation produces winged and wingless individu... which in their turn produce a similar generation. At ... approach of cold weather the winter eggs are laid. It is easy ... detect the presence of the strawberry root-louse by the condit... of the plants, which show lack of vigour, wilt and gradually d... owing to the pest sucking the juices from the roots. It is ... safe to replant strawberries on infested land until some oth... crop has been grown upon it, preferably for two years. As ... aphis and its eggs are readily transported, it is important th... plants should be obtained from non-infested localities. In ca... of doubt they should be dipped in strong tobacco solution ... diluted 'Black Leaf 40,' or fumigated with hydrocyanic gas.

The report also contains remarks on the quarantine regulati... against the Mexican cotton boll weevil (*Anthonomus grandis*) ... list of 351 Tennessee nurserymen having State inspection certi... cates, and a map showing the progress of Texas fever tick eradication work in Tennessee. On 20th December 1912, the... were only eight counties or parts of counties which were st... quarantined on account of the southern cattle tick. During Ju... and August, 1912, an agricultural special train was sent to vario... parts of the State and lectures were held on insect friends an... enemies, and other subjects of technical interest to farmers.

WATSON (J. R.). **The 'Natural Mortality' of the White-Fly.** *Univ. Florida Agric. Expt. Station*, Report for 1912, March 1913, pp. xlviii-lxiii.

On a majority of leaves heavily infested with white-... (*Aleurodes citri*) a few, and sometimes a large number, of the larvae are found to be dead and of a colour varying from d... white to deep brown. These larvae have not been killed either by *Aschersonia*, or by the brown fungus (*Aegerita webberi*) ... by the cinnamon fungus, and writers on the subject have be... accustomed to speak of these dead larvae as the victims of 'natural mortality.' The object of the author's enquiry was, ... possible, to discover the cause. The disease is contagious and ... a grove or row of trees in a nursery it obviously spreads fro...

...tres of infection. It may even be abundant on a few leaves of one plant and practically absent from all other leaves on the same plant. On some leaves it may kill 99 per cent. or more of the larvae, though 10 to 30 per cent. is more common. Microscopical examinations revealed the presence of mycelia of fungi, and further study showed that more than 50 per cent. presented these fungus filaments in their interior. A quantity of larvae were taken from infected leaves and divided into two lots; one was treated with one-tenth per cent. solution of mercuric chloride to sterilise the outside, and the other lot was untreated. Cultures were made by various methods and the process continued until pure cultures were obtained which were then transferred to sweet potato and used for spraying experiments. *Microcera* appeared in nearly 98 per cent. of the colonies, and of these 28 per cent. were pure cultures of *Microcera*. In view of the known pathogenic nature of this fungus these figures in the author's opinion leave little doubt as to the cause of the disease known as 'natural mortality.' It would seem that in a majority of cases this fungus does not develop sufficiently on the white-fly larvae to produce the characteristic white fringe which has given it its name of 'white fringe fungus.' Further observations showed that the adults of *Aleurodes citri* are also attacked by the fungus, and numbers of eggs were observed which were shrivelled and apparently parasitised by it. Having obtained a sufficiency of material the nursery stock in the horticultural grounds of the Station was sprayed. As the plants were already largely infected and it was almost impossible to find plants with uninfected larvae, an estimate had to be made of the extent of infection already existing and of the increase produced by spraying with the fungus culture. The results were not very conclusive, but on the whole tended to show a rise in the mortality of the larvae. It would appear that particular weather conditions are necessary for the rapid spread of the *Microcera*, viz., damp and coolness and also a more or less crowded condition of the larvae on a leaf. This fungus does not seem to be so destructive to larvae as the brown fungus (*Aegerita*). On the other hand it is more generally present on white-fly in the nurseries. The author comes to the conclusion that it would be an excellent plan to include cultures of *Microcera* or of infected larvae when spraying with the other fungi.

WATSON (J. R.). **The Spread and Parasitization of** *Aleurodes howardii*.—*Univ. Florida Agric. Expt. Station*, Report for 1912, March 1913, pp. liv-lx.

This insect, known as the Woolly White-fly, was introduced into Tampa probably from Cuba three or four years ago and has caused some apprehension because of the evil reputation of its very close relative *Aleurodes citri*. Investigation made at Tampa and in the St. Petersburg region showed a general distribution of this fly in all the citrus groves, though in the latter place larger groves outside the city were not affected. Compared with *A. citri*

infestation is by no means severe, although the insect is more apparent on account of its woolly secretion. The fungi which attack *A. citri* were never found on *A. howardii*, but B. states that the red *Aschersonia* occurs on this species in C. The author thinks that the time of year at which the visit was made renders the evidence on this point a little inconclusive, and that possibly the fungi attack *A. howardii* as much as *A. citri*. *A. howardii* is very seriously parasitised by a hymenopteron, probably a Chalcid, 50 to 98 per cent. of the individuals in different colonies showing the oval exit hole of the parasite. A large amount of information is given as to individual outbreaks of the fly and results of spraying with fungi. Attempts were made to import parasitised specimens of the Coconut Whitefly (*A. cocois*) from St. Vincent but the experiments were unsuccessful. Most of the material arrived dead and those that reached Florida alive and were released do not appear to have produced parasites capable of attacking *A. citri*.

RORER (J. B.). **The Green Muscardine Fungus and its Use in Cane Fields.**—*Bd. Agric. Trinidad and Tobago*, 31st March 191[illegible] 14 pp., 2 pls., 2 figs.

The disease of insects caused by the fungus, *Metarrhizium anisopliae*, and commonly called the green muscardine was first discovered in Russia in 1878 among the larvae of certain beetle pests of wheat. Since that time it has been found in nearly all parts of the world attacking a great variety of insects belonging to widely different families. In 1890 it was reported in Trinidad by Hart as one of the natural enemies of the froghopper, and in 1906 Urich again stated that it was common in the Island. It was first tested on froghoppers in Trinidad by Collens in 1908, and the author found it in the latter part of 1909 on dead froghoppers on the Caroni Estate and has cultivated the fungus on a large scale. He has tested it experimentally in a number of cane plantations, and in August last an actual count showed, after six weeks, an average of 92 dead insects per cane-stool. He describes at length practical methods of cultivating the fungus on a large scale, boiled rice having been found to be the most suitable medium for this purpose. Many methods of using the fungus in the field have been tried and two proved successful in certain epidemics of the disease in the latter part of 1912. In the first plan a number of boys carrying tubes containing spores walk through the cane-field and whenever they see a froghopper resting on a leaf they catch it in the tube and let it jump out again. Ten or twelve boys can cover a fairly large area in a day. By this means the fungus was well established in fields at Forres Park Estate. Spreading the spores with a dusting machine is the method which has been most successful in the treatment of larger areas. The spore and starch mixture should be applied at the rate of about three pounds per acre, and the best use for the residual rice is to scatter it about the ground near the cane-stools.

**Proceedings of the Forty-Second California State Fruit Growers' Convention, held at Fresno, Cal., 11th-13th Dec., 1912.**—*Monthly Bull. State Comm. Hortic., Sacramento, Cal.*, ii, nos. 3 and 4, March and April 1913, pp. 353-530.

Several papers of interest to the economic entomologist were read and discussed at the convention. In an address on the control of the red spider, Mr. W. H. Volck mentioned that in California there are three species which are frequently responsible for considerable damage to crops, viz., the citrus red spider (*Tetranychus mytilaspidis*), the yellow mite (*T. bimaculatus*) and the almond red spider (*Bryobia* sp.). A discussion followed on the relative merits of sprays, sulphur dusting being effective only within a short time after it is applied, whereas a sulphur-paste-sulphur-flour-paste spray is more effective and remains longer on the tree. The grape-leaf hopper or 'vine-thrips,' according to H. J. Quayle, is a pest second only to *Phylloxera* as regards damage done, in the San Joaquin and Sacramento valleys. It also occurs in the coast valleys, but is seldom serious there, and also in Southern California, but south of the Tehachapi it is most serious as a pest in the Imperial Valley. Spraying for the nymphs in May or the beginning of June would be well if the hoppers are present in excessive numbers, or capturing by some mechanical means such as by suction, preferably in the early spring, when the shoots of the vine are six to eight inches long. In the course of a paper on 'Details in Citrus Culture' Mr. C. C. Chapman strongly recommended fumigation against the black, red and purple scales, which are numerous and troublesome in every citrus district in California, though less so in the interior than at the coast.

The Californian horticultural quarantine service has active working commissioners in 42 out of a total of 58 counties in the State. The most stringent regulations are in force at the five ports of entry, San Francisco, San Diego, Los Angeles, Santa Barbara and Eureka, no fewer than 45,090 parcels having been fumigated and 3,937 parcels destroyed or returned during the fiscal year 1911-1912, and a total of 847 ships inspected. The tropical fruits carried in the ships' stores are generally infested with maggots, the worst offender being the mango. In the opinion of the chief deputy quarantine officer it would be a good investment for Californian growers to destroy all the mango trees in Hawaii. The immediate source of danger is the possibility of passengers carrying infested material to some country district, and police regulations seem necessary. The steamship companies are very actively co-operating in the matter, and leaflets in several languages are distributed amongst the passengers warning them not to carry tropical fruits with them when leaving the ships.

Fuller (H. J.). **Diseases of the Sugar-cane.**—*Agric. Jl. of the Union of South Africa*, v, no. 5, May 1913, p. 753.

The sugar-cane plantations of Natal are strikingly free from external troubles of any sort. Destructive insects are conspicuous

by their absence, and in view of the consistent efforts which have been made to prevent the introduction of pests from abroad, there is every hope that this happy state of affairs will long continue. During the period of locust invasion the cane-fields suffered constant damage, but this form of insect attack is now a matter of the past. Among the minor troubles, Mr. Fuller, Government Entomologist, records the mealy bug, the cane caterpillar, and the fungus disease known as cane spume. There has been an isolated outbreak of white grub which appears to have been quite sporadic. Cane spume and the cane mealy bug are seemingly quite innocuous to the Uba variety, now almost exclusively grown in Natal.

**Cacao Thrips and Cacao Beetles in Trinidad.**—*Minutes of the Meeting of the Board of Agriculture*, no. 4, 6th May 1913, p. 26.

Mr. F. W. Urich, Entomologist to the Board, reported that he visited Sangre Grande, Carapichaima, Tamana, Chatham and Chaguanas districts and there were hardly any Thrips to be seen. The Cacao Beetle *(Stirastoma)* on the contrary is very prevalent in some districts. Experiments in cutting out larvae and applying arsenate of lead to the trees have been started, but it is too early as yet to record any results. Beetles were more numerous from January to March and are likely to appear again in September and October.

VUILLET (A.). **Les "Chenilles Communes."** [The Brown-tail Caterpillar.] — *Rev. Phytopathologie Appliquée*, Paris, i, no. 2, 20th June 1913, pp. 17-19, 4 figs.

The larvae of *Euproctis chrysorrhaea*, commonly known as "cul-brun" or "cul-doré" are to be found over the greater part of France from the end of January to the beginning of August. The eggs are laid during July, almost always on the lower surface of the leaf, and the larvae weave a sort of common nest in the autumn to protect themselves against the cold and rain of winter. But in the south of France, the same caterpillar, which there lives principally on Arbutus, makes its nest with much less care and comes out of it to feed even in winter. In the more northern parts of the country a thick web appears to be sufficient to protect the larvae from even severe winters.

The author says that there are 17 known dipterous and hymenopterous parasites of this caterpillar in Europe. Some, like *Telenomus phalenarum* and a species of *Trichogramma*, develop in the eggs of *Euproctis*. Others, *Apanteles vitripennis*, *Meteorus versicolor* and *Zygobothria nidicola*, attack the young caterpillars in the autumn, while *Pteromalus egregius* and *Monodontomerus aereus* attack them in the winter. Others again, such as *Compsilura concinnata* and *Tachina larvarum* parasitise the older caterpillars in spring, whilst *Pimpla instigator* and *P. examinator* attack the chrysalis. Predatory insects, such as *Calosoma sycophanta* and *C. inquisitor*, prey upon the insect at

stages. The moths are specially devoured by bats and toads, and the author says that it is possible to see the toads waiting around a light which attracts the moths. In his opinion there is no reason why the attack of this moth should be greatly feared, provided that the fight against it be properly organised and the collection of the tents be thoroughly and systematically carried out, because it can be done at a time of year when there is an abundance of labour, that is to say in the winter, and he thinks it is not necessary to consider any other remedy.

PINEAU (J.). **Les Pucerons des Rosiers.** [The Rose Aphis.]—*Revue de Phytopathologie Appliquée, Paris*, i, no. 2, 20th June 1913, pp. 20-22, 13 figs.

The author, after describing the general biology of the Rose Aphis and the destruction done by it, says that, except in the case of climbing roses, it is not difficult to destroy, and that a 2 per cent. solution of soft soap used as a spray at intervals of eight days will usually be sufficient to clean a rose tree. In serious cases a third spraying may be necessary. He draws attention to the fact that however careful one gardener may be, if his neighbour neglects to clean his trees he will provide sufficient females to undo all the results, and that in consequence it may be necessary to spray almost continually. The destruction of the eggs in winter is important and this may be done by painting the stems with lime in the month of June, or better still with a mixture of quick lime 5 parts, sulphate of iron 3 parts, water 50 parts, all by weight. Another mixture, which he says is even better, is known as Mélange de Balbiani and is made by dissolving 7 lb. of naphthaline in 5 lb. of coal tar, adding 24 lb. of slaked lime and making up to 10 gallons by the gradual addition of water.

SCELSI (S.). **Contro la mosca dell'olivo.** [Remedies against the Olive Fly.]—*Rivista di Agricoltura, Parma*, xix, no. 24, 13th June 1913, pp. 280-281.

The author reminds olive-growers that the time is at hand when all necessary precautions against the olive fly must be taken and that the trees should be sprayed from the early days of July up to the end of October, at intervals of about a month, with either of the following arsenical solutions. (*a*) *Berlese formula*: molasses 20 lb., arsenate of potash 4 lb., water 20 gallons: (*b*) *De Cillis formula*: molasses 130 lb., honey 62 lb., glycerine 4 lb., arsenate of soda 4 lb., water 20 gallons. The spraying with either solution should be done thoroughly, so that the leaves are properly wetted with the mixture. Great stress is laid upon the necessity for combination amongst neighbouring olive-growers in order that the best results may be obtained, as otherwise more than 50 per cent. of the produce on the borders of a well-sprayed olive-grove may be lost owing to reinfection from outside.

**Bentley (G. M.).** **Suggestions on Preparation and Use of Spray Formulas.**—*Tennessee State Board of Entomology, Knoxville*, Bull. no. 10 (ii, no. 3), September [*sic*] 1913, 24 pp., 8 figs.

The author points out that while much may be accomplished in the control of insects by the use of insecticides, more attention should be paid to the prevention of the introduction of crop pests by judicious legislation, to the selection of resistant plants, to the elimination of worthless plants which harbour pests or act as intermediary hosts and are often of the same family as those under cultivation, to judicious rotation of crops, and to better drainage, cultivation and fertilisation. A list of 32 insecticides, fungicides and herbicides is followed by suggestions for the treatment of different crops, arranged alphabetically, when infested by various pests.

**Ballard (E.).** **Some Cotton and Tobacco Pests of Nyasaland.** *Supplement to the Nyasaland Govt. Gazette*, 30th April 1913, Zomba, 9 pp.

The author gives an account of the life-history and bionomics of *Diparopsis castanea* (red boll-worm), *Earias insulana* (Egyptian boll-worm) and *Chloridea obsoleta* (American boll-worm). The first two can be kept in check by collecting all attacked bolls and by thorough ploughing at the end of the season. The red boll-worm appears at the end of January or the beginning of February. The Egyptian boll-worm is not very plentiful, though generally distributed; in Zomba it was first found feeding on the seeds of Hibiscus in the Botanical Gardens. Against American boll-worm the sowing of Chimanga amongst the cotton at the rate of 1 row in 5 at such a time that it will be in tassel before the cotton is in bud, is found to be effective. Leaf-eating caterpillars invade the cotton fields in large numbers from one season to another. In the present year, 1913, they are reported as a serious pest and it is said that very frequently the species is most prevalent one year is absent the next, or only present in small numbers. Last year the larva of *Plusia chalcytes* was very common, but it was attacked by a fungus disease and practically annihilated. Many of these caterpillars are also parasitised by Ichneumons and Tachinid flies, one a species of *Masicera*. The larva of a butterfly, *Hypolimnas misippus*, was also common for a time. The author says that spraying with lead arsenate or Paris green is very effective against caterpillars and might be possible on a small estate, but in a country in which all spraying has to be done by knapsack spraying machines, the cost in labour and machines of spraying a large acreage would be too great.

*Apion armipes* (cotton stem weevil) damages the plants by tunnelling into the stem, and when fully grown pupates there. The stem of the plant is so weakened that it is easily broken by the wind. The best remedy is said to be the burning of all infected plants.

*Prodenia litura* has proved a very serious pest of tobacco plants in the nurseries. It is kept in check to a certain extent

by an Ichneumon. There are two remedies which the author says are possible; hand-picking, which is unsatisfactory, because the larva has a habit of hiding in the ground during the day; and spraying, which is better, because in addition many other pests are killed. He recommends lead arsenate 1 lb. to 60 gals. of water, mixed with molasses or coarse sugar, to be sprayed over the plants once every 10 days as a fine mist and evenly distributed over the leaves. The plants should not drip after the application. The tobacco stem borer [the moth has since been determined by Mr. J. H. Durrant as *Phthorimaea heliopa*, Lower] causes much loss every year in the tobacco nurseries, as every plant attacked is thereby rendered useless for planting out. All infected plants should be pulled up and buried or burnt. The natives of the Protectorate, as also in India, slit the side of the infected stem and remove the caterpillar. This is supposed to enable the plant to grow, but probably the contrary is the case. The worst enemy of tobacco which has been planted out is the greasy cut-worm (*Agrotis ypsilon*). The author recommends the poison bait method as used in America and also the employment of children to search for the worms in ground where they are hiding. Large numbers, the author says, may be destroyed in this way, but he urges that whatever method is used it must be thorough; half measures are of no use whatever.

HARTMAN-HUNT (C. B.). **Notes on Insect Pests.**—*Agric. Bull., Fed. Malay States*, i, no. 10, May 1913, pp. 368-369.

The principal insect pest in the Federated Malay States has been the locust, which has been swarming in many districts in Selangor and Negri Sembilan. The damage has been trivial so far, as the locusts do not attack rubber, but they feed on coconuts and rice, and it would be advisable to keep them in check, so as to avoid an expensive campaign in the future. Parasitic fungus cultures have been tried with little success, but a fair number of Malays, Tamils and Chinese have availed themselves of the local government reward of 50 cents, per kerosene oil tin full of locusts. The locusts seem to have few natural enemies in the F. M. S.

**Drieschweinberge.** [Abandoned Vineyards.]—*Der Weinbau der Rheinpfalz, Neustadt a. Hdt.*, i, no. 11, 1st June 1913, pp. 130-131.

The word Driesch or Dreesch, originally applied in low German to uncultivated pasture land, has, in the Pfalz and other German wine-growing districts, assumed the meaning of a vineyard abandoned for some reason or other or not cultivated for two successive years. Apart from their unsatisfactory appearance these uncultivated vineyards are a constant source of danger to the grower, as they form an ideal breeding place for insect and fungus pests.

Viticulture in the Pfalz was threatened to such an extent by vine-moths and *Phylloxera* that the Bavarian Government, by a decree of 24th April, 1913, compels the owners or occupiers, under a maximum penalty of 1,000 Marks or imprisonment up to one year, to uproot and burn all vinestocks in the 'Driesch' and to plough or dig up the ground thoroughly before the 20th of April of each year. Seedlings growing on the borders of the 'Driesch' must be destroyed before 1st July.

LAMBILLION (L.-J.). **La Mésange et les chenilles d'*Arctia caja*.** [The Tit and the caterpillars of *Arctia caja*.]—*Rev. Mensuelle de la Soc. Entom. Namuroise*, xiii, no. 6, June 1913, pp. 68-69.

In the spring of 1912 a number of caterpillars of *Arctia caja* living in the vinery of M. Lardinois on purslane were all eaten, with the exception of bits of their integument, by a couple of tits which had entered the vinery when the door had accidentally been left open. The destruction of large hairy caterpillars by tits is of interest as the cuckoo was supposed to be the only bird that would eat them.

The author also notes the first appearance on 29th May of *Sesia tipuliformis* on *Leucanthemum vulgare* growing near some gooseberry bushes. Hatching took place on 3rd June. On 7th June the gooseberry *Sesia* was observed on *Sambucus nigra* and on a young oak.

CADORET (M. A.). **Nouveau procédé de destruction du puceron lanigère.** [New method of destroying Woolly Aphis.]—*Rev. Phytopathologie appliquée, Paris*, i, pt. 2, 20th June 1913, pp. 27-28.

This method consists in painting attacked parts of the fruit trees with a mixture of linseed oil, 7 lbs.; white lead, 1½ lbs.; white zinc, 1 lb. These are boiled together for ten minutes and when cold 1 lb. of turpentine is added. The mixture is instructed to be laid on with a brush once in the spring and once in the autumn, though one painting is generally sufficient.

GOOT (P. VAN DER). **Zur Systematik der Aphiden.** [On the classification of Aphides.]—*Tijds. Entomologie, s'Gravenhage*, lvi, nos. 1 and 2, 30th June 1913, pp. 69-154, 20 figs.

In this paper the author undertakes a thorough revision of the Aphides, based on morphological characters hitherto neglected for systematic purposes. Tables for identifying many of the genera and species are given. Of the 12 tribes referred to the subfamily *Aphidinae* only seven are here tabulated, comprising 40 genera, of which 12 are described for the first time.

CAMERON (P.). **On the Parasitic Hymenoptera reared at Dehra Dun, Northern India, from the Lac (*Tachardia*) and Sal Insects.**—*Indian Forest Records*, iv, pt. ii, Jan. 1913, pp. 1-20.

There can be no doubt that the Chalcids of the subfamilies APHELININAE and ENCYRTINAE are direct parasites of the lac and sal insects, but as regards some of the other CHALCIDIDAE and the BRACONIDAE enumerated in this paper, it is probable that they prey on moth larvae which feed on the Coccids. That a Tineid larva does feed on lac insects is certain from the observations of Mr. E. E. Green in Ceylon. If it be the case that they destroy Tineid larvae which kill the lac insects, the BRACONIDAE must be looked upon as beneficial insects, while the ENCYRTINAE and APHELININAE are injurious, as they kill useful insects.

As bearing on the parasites of the lac insect, it may be useful to note that Mr. E. E. Green reared from *Tachardia albizziae* in Ceylon, *Encyrtus tachardiae*, How., *Anastatus tachardiae*, How., *[illegible]* sp., *Tetrastichus* sp. (probably a hyperparasite), *Bracon greeni*, How., and *Aphrastobracon flavipennis*, How., the last two being probably parasitic on moth larvae.

SURFACE (H. A.). **Pests of Domestic Animals, Households and Buildings, Bush Fruits and Lawn Plants.**—*Bi-Monthly Zool. Bull. Div. Zool. Pennsylvania Dept. Agric.*, iii, no. 1, Jan. 1913, pp. 30, 8 figs.

This bulletin is the third of a series dealing with the suppression of insect pests in Pennsylvania.

Of the two Bee Moths, *Galleria mellonella*, L., and *Achroia grisella*, F., the former is much the commoner. The larvae tunnel through the combs, destroy the wax and kill the bee larvae or cap the cells. The suggested remedies are to keep the hives clean and inclined slightly toward the front. Split reeds, placed on the hives with the hollow side downward, serve as a trap for these pests and should be removed twice a week to kill the insects that have collected in them. A strong colony of Italian bees or requeening with an Italian queen is perhaps the best remedy. The Bee Louse (*Braula caeca*, Nitzsch) is common in Europe and is sometimes imported with bees into the U.S.A., though it is not common there. It is easily seen and can be removed with a brush, but when the worker is found with the fly upon it, both bee and parasite should be killed and removed from the hive. Queens from Europe should be carefully examined when received. Amongst other enemies of bees the Kingbird or Bee Martin (*Tyrannus tyrannus*, L.) is popularly supposed to be a great enemy of bees, but it is really more a destroyer of those insects which kill honey bees, such as the Robber-fly, than it is of the bees themselves. Analyses of the stomach contents show that the Kingbird feeds mostly upon drones, and is not a serious enemy of the worker.

The author then deals briefly with pests of stored grain and hay, such as the Angoumois Grain Moth (*Sitotroga cerealella*, Oliv.), the Clover-Hay Worm (*Hypsopygia costalis*, F.), etc.

The following are given as pests of bush fruit: the Currant Borer (*Sesia tipuliformis*, L.), Currant Worm (*Pteronus ribesii*, Scop.), Currant Aphis (*Myzus ribis*, L.), Leaf Hoppers (*Jassidae*), Four-lined Leaf-Bug (*Poecilocapsus lineatus*, F.), San José Scale (*Aspidiotus perniciosus*, Comst.), Scurfy Scale (*Chionaspis furfurus*, Fitch) and the Gooseberry Fruit-Worm (*Zophodia grossulariae*, Pack.).

The common pests of animals are briefly mentioned, with short notes as to remedies, and the author then goes on to discuss the universally distributed pests of the household.

MELANDER (A. L.) & KENT BEATTIE (R.). **The Penetration System of Orchard Spraying.**—*State College of Washington Agr. Expt. Station, Pullman, Washington*, Bull. no. 106, Jan. 1913, 40 pp., 15 figs.

In this bulletin the system of high pressure spraying of orchards is described and details of the apparatus to be used are given, with figures of crooks and nozzles, and a schedule of notes for intending purchasers of power sprayers indicating the points to be studied in the spraying outfit, according to the conditions under which it is to be used. The author says that the penetration system is acknowledged to be the most successful by all commercial orchard owners in the North-Western States. The mist spray nozzle and pressure below 100 pounds were formerly in use, and crooks for directing the spray, so as to prevent waste and secure efficient spraying, were hardly known: now high pressure (250 pounds) is in common use. A case is given of a grower who in 1906, in spite of four applications of strong spray with a power pump, lost 4,000 boxes of apples from Codling Moth. In 1907 the orchard was sprayed on the high pressure system and the total loss for that year amounted to only six boxes. In another case an orchard sprayed on the Vermorel system lost 60 per cent. of its crop, and in the following year, when high pressure was used the loss was reduced to 1 per cent. The returns from a large number of apple-growers are said to show that whereas with seven summer applications per annum with the Vermorel nozzle, they used to secure about 80 per cent. of sound fruit, now with the Bordeaux nozzle and less than half the former number of applications, their returns average over 95 per cent.

The bulletin concludes with a list of 31 publications by the authors on the subject of apple orchard spraying.

HARTZELL (F. Z.). **The Grape Leaf-Hopper.**—*N.Y. Agric. Expt. Sta., Geneva, N.Y.*, Tech. Bull. no. 359, Feb. 1913, pp. 51, 3 figs., 6 pls.

This insect was very abundant during the latter part of the summer of 1911 and it is estimated that in Chautauqua County alone at least one quarter of the vineyards, representing 10,000 acres, showed serious attack on the foliage by this pest. Conditions in other districts were similar. The hard winter of

1911-12 gave reason for hoping that the bulk of the hibernating adults would be killed, but this proved not to be the case, and the growers in consequence sprayed the vineyards more frequently than usual. Nevertheless damage was less than was expected, because the weather from June to September was much cooler than usual and also the rainfall was above the average. The net result was that the number of hoppers going into winter quarters in the autumn of 1912 was less than in the previous year, but the author is nevertheless of opinion that considerable damage may be expected in 1913.

The adults remain on the vines until nearly all the leaves are shed. In autumn they are to be found among fallen leaves, cover crops, weeds and grasses in the vineyards. Hibernation generally begins towards the end of November or the beginning of December. The largest number survive the winter on high, sandy lands where there is no winter flooding and the rains soon drain away. It would appear that the adults are able to withstand considerable cold (14° F. and 18° F.) without any special mortality.

The spring food-plants are raspberry, blackberry, strawberry, burdock, catnip, Virginia creeper, currant and gooseberry, the preference being in the order given. When these plants are lacking they feed on others, for example, beech and sugar-maple. The insects migrate from their spring food-plants to the grape vines, feeding on the lower leaves until about the middle of July and gradually invading the upper portions. This is possibly due to the fact that the insect seems unable to resist wind, as during storms they leave the vines and descend into the grass or weeds, returning when the wind abates.

The results of spraying on several vineyards are given, the sprays used being somewhat varied; chiefly "Black leaf 40" combined with either arsenate of lead or Bordeaux mixture. The spraying was done about the middle of July in all cases. Experiments showed that nicotine at the rate of ·02 per cent. either in water or Bordeaux mixture is an effective insecticide against the nymphs of the grape leaf-hopper.

The general effect of the insects observed is to cause a decrease of woody growth and a depreciation in the quality of the fruit. Concord grapes, which normally have a bluish-black colour when ripe, have a reddish appearance when the vines are attacked by the leaf-hopper. There is also a decided lack of flavour and a decrease of sugar. A table showing the results of analyses of grape-juice is given.

Woglum (R. S.). **Report of a Trip to India and the Orient in Search of the Natural Enemies of the Citrus Whitefly.**—*U.S. Dept. Agric., Bureau of Entomology*, Bull. no. 120, 28th Feb. 1913, 58 pp., 12 pl., 2 figs.

In 1910 the author was requested by the U.S. Bureau of Entomology to search for the home of the Citrus Whitefly and to ascertain if it was anywhere attacked by natural enemies other than those already known in Florida. No *Aleurodes citri* were

found in Spain, Italy, Sicily or Ceylon, nor was the species represented in Mr. E. E. Green's extensive collection of Singhalese ALEURODIDAE. An examination of the ALEURODIDAE in the Calcutta Museum revealed specimens of *Aleurodes aurantii*, Maskell, from oranges from the N.W. Himalayas, which were identical with the Floridan species *Aleurodes citri*, R. and H.; moreover orange leaves from Kulu were found to be infested by the same species. At Saharanpur slightly infested orange trees were discovered, also about 200 specimens of the Coccinellid, *Cryptognatha flavescens*, which were feeding on the pupae of the Whitefly. Two consignments of these Coccinellids were sent to Florida, but they died in transit. A brown fungus, *Aegerita webberi*, parasitising *Aleurodes citri* at Saharanpur, had been introduced into Florida on citrus trees several years ago; but the most important discovery was that of an internal parasite, *Prospaltella lahorensis*, at Saharanpur and Lahore. The author examined orange trees at Peshawar, at Dehra-Dun, in Sikkim, in Assam, at Poona and Nagpur, and concludes that *A. citri* is distributed throughout India. Evidence of parasitism was seen in practically all the infested localities. In Moulmein, Lower Burma, the orange trees examined were free from the pest, nor was it observed in Java during a three weeks' sojourn. Some infested orange trees were seen in Macao, but in the Philippines the pest was absent. Returning to India in April 1911, the author obtained sufficient material of *A. citri* and its parasite *Prospaltella lahorensis*, for transportation to Florida. Many difficulties were encountered, for instance, a number of young orange trees from one to four feet high, on which *A. citri* was intended to feed, were spoilt by a leaf-miner (*Phyllocnistis citrella*) and a bud-worm (*Agonopteryx* sp.). New orange trees were successfully infested by *A. citri* under a canvas awning, which kept out these undesirable pests, and five 'Wardian cases' of natural enemies of the Whitefly were dispatched from Lahore on 20th October 1911. They arrived at Orlando, Florida, on 2nd December, and an examination at the government laboratory showed that 28 healthy *Cryptognatha flavescens* and eight adults and several pupae of *Prospaltella lahorensis* had survived the journey. Unfortunately the Whiteflies were in a dormant pupal state in Florida at that time of the year, and the parasites as well as the Coccinellids, in spite of all efforts to rear them under laboratory conditions, were dead by January 1912.

The following is a list of insect pests of citrus trees seen by the author:—

| *Spain.* | *Italy and Sicily.* |
|---|---|
| *Chrysomphalus dictyospermi*, Morg. | *Chrysomphalus dictyospermi*, Morg. |
| *Parlatoria zizyphus*, Lucas. | *Parlatoria zizyphus*, Lucas. |
| *Pseudococcus citri*, Risso. | *Lepidosaphes beckii*, Newm. |
| *Lepidosaphes beckii*, Newm. | *Pseudococcus citri*, Risso. |
| *Lepidosaphes gloveri*, Packard. | *Aspidiotus hederae*, Vall. |
| *Aspidiotus hederae*, Vall. | *Saissetia oleae*, Bern. |
| *Saissetia oleae*, Bern. | *Coccus hesperidum*, L. |
| *Coccus hesperidum*, L. | |

## India.

*Chrysomphalus aurantii*, Mask.
*Chrysomphalus aonidum*, L.
*Ericerum* sp.
*Monophlebus dalbergiae*, Green.
*Pseudococcus citri*, Risso.
*Aspidiotus latanae*, Sign.
*Lepidosaphes beckii*, Newm.
*Lepidosaphes lasianthi*, Green.
*Coccus hesperidum*, L.
*Fiorinia theae*, Green.
*Vinsonia stellifera*, Westw.
*Aleurodes citri*, R. and H.
*Aleurodes*, 3 spp. (undetermined).
*Papilio demoleus*, L.
*Phyllocnistis citrella*, Stainton.
*Agonopteryx* sp.

FULLER (C.). **The Sombre Twig Pruner, *Thereladodes krassi*, White.**—*Agric. Jl. U. S. Africa*, v, no. 2, Feb. 1913, pp. 263-288, 3 figs., 10 pls.

This species was described by White in 1855 from Port Natal and is aboriginal. It is widely spread throughout South Africa and sooner or later may become a pest wherever its food-plants are extensively grown.

The author's observations relate chiefly to its attack upon privet and were made in consequence of the extraordinary destruction of privet hedges by the pest during 1910. He is of opinion that if the cultivation of olives assumed importance anywhere in the Union of South Africa this would become a serious pest. The attack on privet usually begins in a small way, becoming intensified from year to year because the broods of beetles display but little tendency to migrate and have a great inclination for laying their eggs on the plant on which they themselves have been bred. According to the author this pest is very easily controlled; its work is always conspicuous and the borers can be so readily traced that any plant or plants may be freed from them at once by the removal of the invaded stems.

The adults leave their tunnels about November and egg-laying commences soon after; as emergence goes on until the end of January the laying of eggs is spread over no less than four months in the year and the broods thus become mixed. The eggs are laid singly in a cavity beneath the bark which is excavated with extreme nicety and the making of it may occupy as much as an hour. The eggs hatch in about twelve days and the borer starts tunnelling in the centre of the stem and from time to time pruning off portions of the already perforated part. The boring is continued always toward the root and no upward or lateral deviation is ever made apart from the initial burrow. The grub stage of the main brood is completed during August and September, when pupation takes place, the adults emerging from these pupae during September and October. The beetles are on the wing from the beginning of November to the end of February and after this they die off. The grubs are to all intents and purposes present all the year round, and before the large grubs from the previous season's eggs have finished feeding, young ones are already at work.

In many cases observed by the author the insect after ovipositing proceeded up the twig a couple of inches and there girdled

it so that it broke off. This was at first thought to be a regular practice but extensive observations have shown that only about one tip in three was so treated. The method of tunnelling by the larva is carefully described and illustrated.

A minute hymenopterous parasite of the egg was found, but parasites or enemies of the grub or pupa have thus far been noticed.

HASEMAN (L.). **Some Orchard Insects of Missouri.**—*Missouri State Board of Horticulture*, Bull. no. 51 (N.D.), pp. 1-31, 4 figs., 7 pls.

In this bulletin the author has given a more or less complete list of the insects injurious to fruit, with a description of each and an account of the life-history, food-plants, nature of the injury done and the remedies. Under insects injurious to the apple he gives Woolly Aphis (*Schizoneura lanigera*, Hausm.) and the Round-headed Borer (*Saperda candida*) which deposits its eggs in the bark during June and July, the grub completing its development in the spring of the 3rd year. The injury is chiefly to young trees and the damage is very largely increased by fungi growing in the burrows. Cutting out appears to be the only remedy, but washes for the trunk are useful as preventives. The Flat-headed Borer (*Chrysobothris femorata*, F.) is not confined to apple, but attacks oak, beech, ash, pear, peach, plum, hickory, chesnut, maple, linden, sycamore, willow and box elder. Trees that have been planted out not more than a year or two will often be completely girdled by 2 or 3 of these grubs and destroyed; the remedies suggested are the same as for *Saperda*. The Shot-hole Borer (*Scolytus rugulosus*, Ratz.) is liable to be overlooked until considerable damage has been done, and multiplies so rapidly that a tree attacked in the spring is often completely destroyed by autumn. The beetle prefers trees which are sickly. All dead or dying trees should be cut down and all dead branches destroyed.

San José Scale (*Aspidiotus perniciosus*, Comst.) is dealt with at some length, as also the Scurfy Scale (*Chionaspis furfura*, Fitch) and the Oyster-shell Scale (*Lepidosaphes ulmi*, L.). Apple Plant Lice (*Aphis mali*, *sorbi*, *pomi*) can be easily controlled by the use of tobacco contact washes. The injury done to apples by the Buffalo Tree Hopper (*Ceresa bubalus*, F.) is considerable, the trees being totally destroyed in some cases. In the summer the nymphs migrate to weeds and other plants, and the only successful remedy is to clear away this food supply; if the pests are very troublesome, severe pruning is of some value. The Apple Leaf-Hopper (*Empoasca mali*, LeB.) principally attacks young trees up to 4 years of age. It breeds with great rapidity, and the curling of the leaves produced is apt to render spraying ineffective; while the adult insects seem to be extremely resistant. Kerosene emulsions are very useful, as also is the trailing of sticky shields between the rows.

The Evergreen Bagworm (*Thyridopteryx ephemeraeformis*, Haw.), in some parts of the State, is the most destructive pest

...ples that has to be dealt with, especially in south-western ... central Missouri. In the cities the larvae are equally ...gerous to ornamental and shade trees. The usual Codling Moth washes are useful if applied within a week after the blossoms ... The damage done to apple trees by Fall Cankerworm (...*la pometaria*, Harris) is often very serious and sometimes ... foliage is entirely stripped. They are also not confined to ... trees. It is necessary to spray early, when the cater...ars are small, as when well grown they are very resistant ... poisoned sprays: 3 lb. of arsenate of lead to 50 gals. of water ...sually quite effective, if applied in time. Bands of fluffy ... or tanglefoot will prevent the wingless females from climb...up the trees to lay their eggs. One spraying should be given ... the blossoms are out, and a second about a week after ... fall. The same methods are recommended for Spring ...erworm (*Paleacrita vernata*, Peck.). The Rascally Leaf ...pler (*Phycis indiginella*, Z.) is an exceedingly troublesome ..., feeding on the foliage of young apple trees and upon the ... of young twigs. It has also been known to attack plums, ... and cherries. It is a native of the State and is found in ... numbers upon the red haw and wild crab, which should ...fore be destroyed in the neighbourhood of orchards. The ... easily controlled in the early spring by the usual spraying ... Codling Moth. The Apple Tent Caterpillar (*Malacosoma ...ana*, Harris) is also readily controlled either by poison or applying a torch to the tents when they are quite small. The ...-marked Tussock Moth (*Hemerocampa leucostigma*, Sm. ... Abb.) is the most troublesome species of the genus. The ...est amount of harm is done in nurseries and very young ...ards, but shade trees in cities are often seriously attacked. ... pest can be controlled either by poison or by banding the ..., as the female moth is wingless. The Fall Webworm (...*antria cunea*, Drury) is usually more abundant on mulberry ... box elder than on fruit trees, but in some districts it does ... damage in orchards. Burning out the webs in summer or ... autumn is the simplest remedy; a little poison sprayed on ... foliage immediately around the web is effective. For the ...-necked Apple Caterpillar (*Datana ministra*, Drury) and ... Red-humped Apple-Worm (*Schizura concinna*, Sm. and Abb.) ...ing the trees and trampling the fallen caterpillars on the ...nd is a simple method of control; or a little poison sprayed ...nd the places where they are feeding will soon destroy them. ... Fruit-tree Leaf-Roller (*Cacoecia argyrospila*, Walk.) is ... abundant throughout the orchards of Missouri, feeding on ... young leaves, and later does some damage to the fruit. ...ing moth sprays, if carefully made and very carefully used, ...ood remedies for this pest, although it is somewhat difficult ... at under its leaf shelter. The Lesser Apple Leaf-Folder (... *minuta*, Robs.) is chiefly a pest of nurseries. Arsenical ...ays are the best remedies and the first brood should be ...oyed if possible, by spraying as soon as the moths appear.

The Spotted Tentiform Leaf-Miner (*Ornix prunivorella*, Cham.) ... the most important of a number of leaf-miners found in

Missouri, and in the past year has been exceedingly ab... and troublesome in apple orchards. Remedies for this typ... pest are not easily found; poison will not reach it insid... leat and the complete destruction of the foliage in winter ... to be the only method of stamping it out.

The Codling Moth (*Carpocapsa pomonella*, L.) last ... destroyed from one-third to one-half of the Missouri appl... It has been found that if the fruit is sprayed a week or 10 ... after the blossoms fall with a high pressure and a fairly ... spray, the cups at the blossom end of the apple will retai... poison for the pests which begin to arrive a week or 10 days ... if thoroughly done, this will do more to control the pest than ... other measure. A second application is desirable 2 weeks ... and a third 6 weeks later, so as to catch some of the second b... The destruction of windfalls is important. The same p... will serve against the Lesser Apple-Worm (*Enarmonia prun...* the life-cycle of which is almost identical with that of the C... Moth.

The Plum Curculio (*Conotrachelus nenuphar*, Hbst.) is ... important pest of the apple and peach than of the plum, ... perhaps the most serious fruit pest in Missouri. The ins... a native and was first found to be attacking wild plums. ... exceedingly difficult to control. By spraying in spring, w... beetles begin attacking the fruit, the majority of them ... destroyed. The spray should be given within a week afte... blossoms fall, and then again a week or 10 days later. Cultiv... for the orchards in July and August is useful, as it the s... well broken up, the pupal cases are brought to the surface ... destroyed. Windfalls should be carefully collected.

The Plum Tree Aphis (*Aphis prunifolii*, Fitch) is most des... tive in the early spring. Thorough application of 10 per ... kerosene emulsion or some nicotine preparation will destr... Winter spraying with lime-sulphur will usually destroy the ... and prevent trouble in the spring. Plum Lecanium S... (*Lecanium* spp.). There are 3 species of these scales ... plums, but only one is troublesome in Missouri. Where no... numerous the pest can usually be checked by pruning out ... branches, otherwise the usual San José Scale methods shou... employed.

The Pear Blister Mite (*Eriophyes pyri*, Pgst.) can ... detected in the early summer by the small brilliantly c... gall-like forms on the foliage. There are several species, ... that dealt with is by far the most important. Oils and ... sulphur, as used for scales, will generally prove efficacious ... application should be given in the autumn, just as the ... are falling, and a second in spring, just before the buds ... summer spraying is of little avail. A careful pruning in ... early spring is often useful.

The Pear Tree Psylla (*Psylla pyricola*, Först.) is easily ... trolled by the use of kerosene emulsion diluted with ab... parts of water, and one careful application about the midd... May will usually suffice, though in bad cases it may be nece... to repeat it. Arsenate of lead (2 lb. to 50 gals. of water

recommended for destroying the Pear Slug (*Eriocampoides limacina*, Retz.). The complete life-history of the Black Peach Aphis (*Aphis persicae-niger*, E. F. Smith) is not properly known. It is primarily a root pest, and has been troublesome in many of the southern peach-growing districts, having been reported upon nursery stock in Missouri, though, up to the present, the amount of damage done by it in the State is not great but it probably will increase in the near future. All young trees received from the nursery should be fumigated or thoroughly dipped. A strong solution of tobacco decoction is probably the best dip to use and the grower can thus usually delay the arrival of the pest for many years. Once it has entered a young orchard, the soil should be cleared away from the base of the infested trees, a pound of ground tobacco strewed round them and the soil replaced. The pest presents the same difficulties as the woolly aphis of the apple; the best results will probably be secured by careful cultivation of the orchard and by providing the trees with an abundance of food so as to be able to stand the attack of the pest.

The Peach-Tree Borer (*Sanninoidea exitiosa*, Say) is primarily a pest of young trees and if they can be kept free for the first 3 or 4 years after they are planted out, the later injury is not usually important, but the damage to very young trees is often very great. Insecticides are practically useless once the pest is established, and the best method of control is to select an orchard site as far from infested trees as possible and to inspect each tree planted. Following this with careful cultivation and regular inspection for borers, the young orchard can generally be kept in good condition. The most effective and cheapest method of cleaning up a badly infested orchard is to cut out all the larvae between September and December; then in May repeat the operation, and thoroughly spray the trunk for 2 ft. up and 6 or more inches below the ground with a solution of lime-sulphur of the strength used for winter spraying for San José Scale with double the quantity of lime and 1 lb. of arsenate of lead to every 50 gals. of the preparation.

The Terrapin Scale (*Eulecanium nigrofasciatum*, Perg.) can be kept under control by spraying in late autumn or spring with a strong solution of lime and sulphur, but oil washes seem to give better results. Nothing can be done in summer, because the strength of the wash required would seriously damage the leaves. This pest is becoming very troublesome in many parts of the State of Missouri, and in the author's opinion special control measures will have to be considered.

Peach orchards which are thoroughly sprayed for scale or Curculio do not suffer much from Peach Twig Borer (*Anarsia lineatella*, Z.). Winter sprays of oil or lime-sulphur seem to penetrate the hibernating cells and destroy the caterpillars. Early spring spraying with poison for the Curculio will also reach the majority of those feeding upon the developing shoots.

The Black Cherry Louse (*Myzus cerasi* F.) and the Cherry Scale (*Aspidiotus forbesi*, Johns.) are not serious pests and are easily controlled by the usual washes.

The Quince Curculio (*Conotrachelus crategi*, Walsh) is almost completely protected from treatment by poisoned sprays. For

a week or two in the early summer, when the pest is in the resting stage, many may be destroyed by surface cultivation and by careful collection. The destruction of windfalls, either by hand or by allowing the pigs to run in the orchard, will check the pest. The jarring method is also of some value. The beetle is altogether more difficult to handle than the Plum Curculio, but fortunately its work seems to be largely confined to the fruit of the quince.

The Praying Mantis (*Stagmomantis carolina*) is, in the author's opinion, one of the most important beneficial insects in the orchards of Missouri and is common in the State. The eggs are deposited late in autumn in oval packets cemented to twigs and other objects and many are destroyed instead of receiving the protection and encouragement which is their due, as each packet contains 100 or more eggs and every insect which feeds throughout the summer may, under favourable conditions, save several dollars worth of fruit.

The report concludes with some general remarks on the value of Coccinellids, *Chrysopa*, Syrphids and certain Hymenopterous and Dipterous parasites.

SCHOENE (W. J.). **Zinc Arsenite as an Insecticide.**—*N.Y. Agric. Expt. Sta., Geneva, N.Y.*, Tech. Bull. no. 28, March 191[illegible], 15 pp.

This is a report of a series of experiments with zinc arsenite and lead arsenate to determine their relative toxicity to insects and the safeness of the former for use on foliage. One pound of it proved equal to three pounds of lead arsenate. Zinc arsenite when added to calcium hydrate or Bordeaux mixture caused no injury to apple foliage; but more or less spotting of apple leaves occurred when the poison was used alone or in combination with lime-sulphur or glucose. Zinc arsenite alone or with glucose caused severe burning of grape foliage. Laboratory tests suggest that the injury to foliage may be due in part to the solubility of the poison in carbonic acid. The contradictory results from the use of this poison on foliage suggest that the manufactured product is not stable or uniform.

Zinc arsenite or lead arsenate with Bordeaux mixture, soap or glue, continued effective for twenty-five days. Either of the poisons alone, or with glucose, gradually lost its poisonous properties on exposure to weather and by the end of this period had ceased to protect the foliage.

Incidentally, it appears in these tests that the lime-sulphur solution does not resist wet weather as well as Bordeaux mixture.

A list of results of previous experiments with zinc arsenite by various authors in different parts of the United States is given. The experiments were made upon *Lina scripta*, *Mamestra picta* and *Hyphantria cunea* in the laboratory, and on the Spiny Elm Caterpillar (*Vanessa antiopa*) and the larvae of the Willow Beetle (*Lina scripta*) in the open. The insects as a rule ate only one meal on freshly sprayed foliage and fed very little afterwards until death ensued, and in all cases the amount consumed in the initial meal was greater with the check than with any of the

sprayed plants, indicating that either there was a reaction by the insect to the poison or that the spray possessed distasteful properties. In the tests in which foliage had been exposed to the weather, the period of feeding was more extended, depending on the interval between spraying and the feeding. Twenty-five days after spraying, caterpillars fed voraciously for two to six days before the poison became effective.

Details are given as to the effect on vine foliage of various sprays.

Urich (F. W.). **Beetles affecting the Coconut Palm.**—*Proc. Agric. Soc., Trinidad and Tobago*, xiii, pt. 4, 3rd March 1913, pp. 164-167.

The principal beetles which damage the coconut palm in Trinidad are the Gru-gru beetle and the Bearded Weevil, and to a less degree the Rhinoceros beetle. The Gru-gru beetle generally attacks palms that have been injured by a cutlass or broken by the wind or by fronds falling from taller trees. In these cases the injury may not be noticed and the beetle is credited with attacking a healthy tree, but this can hardly be its normal habit, because if it were not rare and exceptional there would not be a single coconut palm left in the island. The practice of using the larvae as table delicacies should keep down the beetles. Gru-gru beetles (*Rhynchophorus palmarum*) also attack palms affected by root disease or bud-rot and will only attack the soft tissues. The Bearded Weevil (*Rhina barbirostris*) makes tunnels in the hardest parts of the stem, but appears principally to attack palms that are suffering from fungoid disease or which have been burnt; the amount of damage done is not very great, the only danger being that the stem may occasionally be weakened and the tree snap off in a gale. Whenever these weevils are numerous it is a sure sign that the tree is attacked by fungi or bacteria and it would be better to fell or burn it.

The natural enemies of the Gru-gru beetle are larvae of the Histerid beetle, *Oxysternus maximus*. A Tachinid fly (undetermined) has been bred from the larvae of the Bearded Weevil. A species of *Xyleborus* also attacks palms, but only burnt trees or those which are suffering from fungoid disease. Two species of Weevil Borers, *Metamasius obsoletus* and *M. hemipterus*, are generally found associated with the Gru-gru beetle. Healthy palms are apparently not attacked. The coconut scale, *Aspidiotus destructor*, is restricted, but is generally injurious when associated with the Balata Ant (*Azteca chartifex*). When the ants are absent Coccinellid beetles are an efficient check.

Maxwell-Lefroy (H.) & Finlow (R. S.). **Inquiry into the Insecticidal Action of some Mineral and other Compounds on Caterpillars.** — *Mem. Dept. Agric., India, Pusa*, Entom. Series iv, no. 5, March 1913, pp. 267-327.

This paper gives the detailed results obtained in a large series of tests of poisons on caterpillars. These experiments were made

in the hope of finding a substitute for arsenicals, and their practical outcome has been the selection of lead chromate as a standard stomach poison to replace arsenical poisons. Accuracy was sought to be obtained by using as far as possible chemically equivalent amounts of each compound. A list of the insects used as subjects, and instructions for the preparation of naphthalene emulsion and of copper borate on a large scale are to be found in appendices.

FAUCHÈRE (E.). **Le ver à soie.** [The Silk-worm.]—*Bull. Economique, Tananarive, Madagascar,* xiii, no. 1, 1913, pp. 92-111.

Monovoltine breeds of silk-worm (*Bombyx mori*) introduced into Madagascar after a certain time become polyvoltine, a phenomenon recorded by Natalis Rondot in the case of silk-worms imported into Guatemala. Vice versa, polyvoltine strains introduced into Europe from tropical countries become monovoltine, so that it is inexpedient to adhere to the term 'race' and advisable to speak of silk-worms adapted to temperate or tropical climatic conditions. Results obtained in the interior of Madagascar and Réunion tend to show that acclimatised strains, producing five or six generations per annum, if properly cared for, produce silk of a quantity and quality equal to that obtained from French silk-worms. A discussion of climatic conditions in Madagascar leads the author to the conclusion that the production of silk from *Bombyx mori* may be undertaken in all tropical countries, even if they are very hot and very humid. However, one cannot hope to produce cocoons of the first quality except in the mountainous parts of these countries, where the temperature is not too high and there are frequent winds, all conditions which coincide admirably with those obtaining in Central Madagascar. There it is possible to rear five generations, but the generation hatching during the cold season cannot be used for silk. The period between hatching and harvesting the cocoons is about 45 days.

The buildings in which the silk-worms are to be reared (magnaneries) must be erected on an eminence well exposed to the wind and away from moisture. The wood used must be smooth, in order not to harbour parasites. Except in the case of a new 'magnanerie' it is imperative to disinfect the latter before rearing each generation, either by applying limewash or copper sulphate solution, or by fumigating with formaldehyde or sulphur dioxide. The silk-worm eggs hatch from 12 to 13 days after they are laid, and the young silk-worms thrive best at a temperature of about 20° C. At the Sericultural Station at Tananarive the temperature falls to 17° in the mornings during October and April, and at higher altitudes, as in Ankaratra, it is necessary to resort to artificial heating. From observations made at the Sericultural Station at Nanisana it appears that about 545 kilograms ot carefully selected and cleaned mulberry leaves are necessary for rearing the larvae from 25 grams of eggs. After a thorough discussion of rearing methods, the author proceeds to

... an account of parasites and enemies of the silk-worm, ...ally of pebrine, muscardine, flacherie and grasserie, the ...t remedies against silk-worm diseases being scrupulous clean-...ss, avoidance of fermented leaves, etc. Among the predatory ...es of the silk-worm in Madagascar ants, rats and mice have ... guarded against. The silk-worm fly (Uji in Japan, Kuji or ...dang in Indo-China) is fortunately unknown on the island, ... related species attacks *Berocera madagascariensis.*

... (R. W.). **Insect Pests of Tobacco in Southern Rhodesia.**—*...ept. Agric., Salisbury, Rhodesia,* Bull. no. 140 (N.D.), 18 pp., 7 pls.

The most troublesome pests of tobacco in Southern Rhodesia ... the cut-worms, especially in the seed-beds; the stem-borer, *...rimaea heliopa;* and the so-called wire-worms sometimes ...se serious and unexpected loss. There are several species ... cut-worms which are more or less injurious, *Euxoa segetum* ...d *Agrotis ypsilon* being particularly active. It has been ...rved that some of these larvae are capable of fasting for ...ral weeks together and the the duration of the larval stage ...ns very variable. The pupal period of some of these species ...so varies, in one species from 12 days to 6 weeks.

To ensure that the seed-beds are free from cut-worms when ... seed is sown, they should first of all be thoroughly burned ...r with wood or dry tobacco-stalks; but this is not sufficient, ...ause of the presence of cut-worms in the neighbouring ground. ...d the use of poisoned bait made of molasses 2 qts., Paris green ... lb., and maize meal or wheat bran 50 lbs., is said to be effective, ...also is the Mally formula used in Cape Colony. The author ...ather recommends the growing of lettuce or some other hardy ...getable to furnish green-stuff for baiting purposes. It must be ...ne in mind that the tobacco seed-beds in October and November ...esent a large area of succulent vegetation when this is scarce ...sewhere, so that the cut-worms are attracted from considerable ...stances round. The ground should be cleared for 30 yards in ... directions round and this cleared area should be thoroughly ...ted before sowing. Whatever form of bait is used it should ... distributed in the evening so as to avoid the drying effect of the ...n. The bait is most effective the first night and if the ground ...ated has been cleared for some little time the cut-worms, being ...ngry, will be poisoned in large numbers. The baiting should ... repeated a week later.

To protect the beds from infestation after the plants are above ...ound, the greatest care should be given to the soundness of the ...ering material, to its proper adjustment each night, and to the ...ghtness of the bricks enclosing the beds; the object being to ...clude the adult moths and prevent the depositing of eggs on ... near the plants. Clean cultivation is a great preventive ...medy. If the seed-bed becomes infested it is exceedingly diffi...ult to destroy the larvae, and the bait, although evenly distri...buted, does not entirely prevent damage. Cut-worms can be ...ollected by natives, who show special aptitude for this work.

and a few good "boys" are capable of rendering the use of insecticides unnecessary. Each half-grown cut-worm destroyed can be reckoned as a score or more plants saved.

The Stem Borer (*Phthorimaea heliopa*, Lwr.) is a native of South Africa but is also recorded as damaging tobacco in India. The damage done in Southern Rhodesia to the seed-beds is serious, for the seedlings are frequently attacked when quite small. The presence of the larvae in the stem causes a swelling to form and above this swelling the plant will not grow. Suckers grow out from beneath the swollen portion of the stem, but, if unaided, practically no leaf worth reaping is produced. The preventive methods consist in the protection of the seedlings in the beds from the moths, and discarding all seedlings that show swellings when planting out. All stray tobacco plants round about the seed-beds should be destroyed, as they provide breeding places. Remedial measures are not practicable, though it is said that if the plant is severed below the swelling and all but the strongest suckers removed, a fair amount of leaf will be produced, provided the plant is young enough.

The Tobacco Miner or Split Worm (*Phthorimaea operculella*) chiefly attacks the leaves and although found in the stems is not known to produce any swellings. The insect is also a bad pest of potatoes. The eggs are laid singly on the plant, hatching in from 6-10 days and the larvae eat out the substance of the leaves in irregular patches. They have a habit of leaving old mines and starting new ones, and this habit is of some importance in connection with control measures. The pupal stage is passed inside the plant and the moth, under favourable conditions, emerges about five weeks from the hatching of the egg. The lower leaves are those chiefly attacked, and as tobacco from Southern Rhodesia is not at present grown for the purpose of making cigar wrappers, the injury is not of the same importance as in some other tobacco-growing countries. Much good leaf is, however, liable to attack and it is no uncommon sight in the barn to see hundreds of these caterpillars hanging by threads from the drying leaves or crawling rapidly over the ground in endeavours to escape the uncomfortable heat. Preventive measures consist in covering the seed-beds thoroughly at night and destroying all plants which may serve as breeding places for the moth during the winter. The insect breeds in the thorn apple or "stinkblaar" (*Datura stramonium*) and this should be destroyed as much as possible in the neighbourhood of tobacco lands. Spraying with arsenate of lead or Paris green might possibly destroy many of the insects when starting new mines.

The caterpillars of *Laphygma exigua* are also injurious to tobacco in Southern Rhodesia, but in ordinary years it has been been found that they can be kept under sufficiently by collection and destruction during topping operations. In some seasons they appear in too great numbers to be left so long, and in the absence of spray pumps the whole labour on the farm has to be devoted to this work. The author strongly advises growers to keep a few pumps of the knapsack pattern on hand in case of a bad invasion, and says that the most suitable spray is: Paris green 1 lb., fresh slaked lime 2 lb., water 160 gals.

The Bud-worm (*Chloridea obsoleta*) does not yet attack the buds and injury to seed-capsules, although common, is not at present of great consequence as seed is not collected in Rhodesia. Beetles belonging to the following genera have been observed or reported as damaging tobacco: *Zophosis*, *Gonocephalum* (*Opatrum*), *Psammodes* (tok-tokje), *Dictha* and *Anomalipus*. Of these the most to be feared are *Zophosis* and *Gonocephalum*. These beetles will apparently gnaw any part of the plants within reach. Deeply set plants in which the growing heart is well underground escape serious damage, even when the beetles are abundant. The use of grass dipped in cut-worm poison is efficacious bait. *Gonocephalum* can be trapped under heaps of rubbish, which may be burnt.

A large Cricket is also occasionally a troublesome pest of tobacco. It is undoubtedly associated with the crop because of its preference for light sandy soils rather than because of any special preference for tobacco. These insects sever the leaves and drag them to their burrows. Grasshoppers of various species attack tobacco in the seed-beds and in the fields chiefly in the early part of the season. Arsenical sprays are useful against them.

The Cigarette Beetle (*Lasioderma serricorne*) is well known in Rhodesia, and 24 hours fumigation with carbon bisulphide at the rate of 1 lb. to 1,000 cubic feet of space is recommended. The author says that bales should be opened up to enable the gas to penetrate. *Tribolium confusum* is usually a pest of grain and farinaceous products, but in Rhodesia it has also been recorded as attacking stored tobacco.

Jack (R. W.). **The Bean Stem Maggot.**—*Dept. Agric., Salisbury, Rhodesia.* Bull. no. 142, April 1913, 9 pp., 4 pls.

This insect has been described as *Agromyza fabalis* by Mr. Coquillet, from specimens bred from bean stems at Rosebank, near Capetown, and appears to be generally distributed south of the Zambesi, having proved injurious in centres so widely separated as Capetown and Salisbury. So far as the author is aware, this is the first notice of its habits and the injuries caused by its attacks.

Under cage conditions the development of the insect occupies 36 days, of which 20 are taken up by the egg and larva and 16 by the pupa. Three days after emergence the fly deposits its eggs in the leaves of young plants, the larvae subsequently making their way into the stem and congregating at its base. Decay may set in and the plant die suddenly; 20 to 30 per cent. and more of the young plants of certain varieties of cowpeas have been seen to die off in this way. Stronger or less heavily infested plants survive and the wounds heal, with the result that a swelling is formed at the base of the stem; even then the growth of the plant is often practically stopped. Others grow fairly well, but are stunted, the plant being bushy and the internodes short. These remarks apply chiefly to cowpeas and beans grown as crops. French beans in gardens, which are used in the green state, do

not suffer so badly, but the young plants are sometimes killed and still more frequently stunted. The author says that on every farm where cowpeas or kafir beans have been planted in the Marandellas district all the plants showed the results of wholesale infestation. On one farm near Salisbury 14 acres of haricot beans had been completely ruined and in other places considerable damage from the pest was observed.

Soya and velvet beans are not attacked at all, the host plants of this insect appearing to be those of the genera *Vigna* and *Phaseolus*, which have a considerable number of common wild representatives in Rhodesia, and without doubt these formed the natural hosts of the maggot before the introduction of cultivated varieties; it is the presence of these wild plants that makes the task of controlling the pest difficult. Certain varieties of cowpeas appear to be much more resistant than others. In the experimental plot at Salisbury most young plants of "Iron" were lost; "Black-eyed Susan" was very badly damaged; "Whip Poor Will" and an unnamed variety secured a fair stand, but many plants died; while "Natal Black" and "New Era" throve best. Kafir beans were noticeably more resistant than most imported cowpeas, although young plants frequently died from the attack. The maggot is extensively parasitised by a species of Braconid wasp.

The cowpea is grown as a secondary rotation crop in order to renew the nitrogen content of the soil and is not sufficiently valuable in itself to bear the expense of treatment. Liberal manuring has a good effect, as it induces vigorous growth and consequent resistance to injury. Complete infestation of crops may occur the first time that they are planted on new farms. Possibly a trap crop of cowpeas, sown with the first rains along the edge of the land intended for the main crop and ploughed under after about three weeks growth, would serve to reduce the initial infestation of the main crop. The author thinks that the discovery or production of varieties which will grow and yield a good crop in spite of the infestation with this pest is by no means improbable.

Schoene (W. J.) & Fulton (B. B.). **Apple Insects.**—*New York Agric. Expt. Station, Geneva, N.Y.*, 25th April 1913. Circular no. 25, pp. 11, 11 figs., 4 pls.

The insects dealt with in this circular are the following:—Pistol Case-bearer (*Coleophora malivorella*, Riley), Cigar case-bearer (*C. fletcherella*, Fern.), Bud Moth (*Tmetocera ocellana*, Schiff.), Oblique-banded Leaf-roller (*Archips rosaceana*, Harris), Fruit-tree Leaf-roller (*Archips argyrospila*, Walker), Apple Bugs (*Heterocordylus malinus*, Reut., and *Lygidea mendax*, Reut.), Green Fruit Worms (*Xylina* spp.), Codling Moth (*Cydia pomonella*, L.), Lesser Apple Worm (*Enarmonia prunivora*, Walsh), Palmer Worm (*Ypsolophus pometellus*, Harr.), Plum Curculio (*Conotrachelus nenuphar*, Herbst.), White-marked Tussock Moth (*Hemerocampa leucostigma*, Sm. & Abb.), Apple Maggot (*Rhagoletis pomonella*, Walsh), Gipsy Moth (*Lymantria dispar*, L.) and Brown-Tail Moth (*Euproctis chrysorrhoea*, L.).

A brief life-history is given of each and short directions for treatment, and the circular concludes with instructions for the application of lime-sulphur wash as a general insecticide throughout the year.

DUBOIS (Dr. A.). **Pour la protection des oiseaux.** [Bird protection.]—*Bull. Soc. Zool. France, Paris*, xxxviii, no. 4, 23rd May 1913, pp. 127-133.

A plea for the protection of insectivorous birds in France from dealers (millinery and game) and a review of legislation in various countries. The Belgian bye-laws prohibiting the killing, having, selling or carrying of insectivorous birds are reprinted in full.

**La finezza degli zolfi destinati ad uso agricolo.** [The fineness of sulphur intended for agricultural purposes.]—*L'Agricoltura Moderna*, xix, no. 10, 29th May 1913, p. 116, 3 figs.

The relative degrees of fineness of three commercial brands of sulphur for agricultural purposes are discussed in this article and the importance of extreme fineness in order to secure the best results is insisted upon. Three micro-photographs are reproduced (1) of ordinary ground sulphur (60° fineness, Chancel), (2) sulphur which has been graded by the use of fans 85°-90° Chancel), and (3) of sulphur prepared by a special process (100° Chancel). The relative fineness may be expressed as follows:—178,000 particles of No. 1, 22 millions of No. 2, and 36 millions of No. 3, are respectively required to weigh one gramme. It is pointed out that there are many other brands in the market which are very much coarser than any of these and that the use of an exceedingly fine sulphur may result in economy estimated at from 30 to 50 per cent., the coarser varieties being very largely ineffective, owing to the larger grains falling off the plants and taking no part in the chemical action on which the use of sulphur for dusting purposes is based.

CHITTENDEN (F. H.). **The Spotted Webworm.**—*U.S. Dept. Agric., Bureau of Entom.*, Bull. no. 127, 31st May 1913, 11 pp., 4 pls., 3 figs.

The author says that this pest (*Hymenia perspectalis*, Hübn.) attracted his attention on two occasions from its occurrence on beets in the District of Columbia. He says it is somewhat singular that it was first observed in 1905 and was not again noticeable until 1912, when it became a veritable pest. It may be classed both as an enemy of sugar-beet and as an insect injurious to ornamental plants in garden and greenhouse. The moth, larva and eggs are described and the distribution throughout the world is given. Nothing is known of the origin of the species and it is uncertain whether it comes from the Old or the New World, but it has obviously been introduced into the United States.

The species is not known in Europe, but will probably in time become cosmopolitan: the other known species are African. The larvae are apparently of nocturnal habits and during the day conceal themselves about the bases of the plants.

The following beetles are apparently associated with the larva: the Yellow-necked Flea-beetle (*Disonycha mellicollis*, Say) and the Spinach Flea-beetle (*D. xanthomelana*, Dalm.). In a single instance the Hawaiian Beet Webworm (*Hymenia fascialis*, Cram.) was reared from Swiss cardoons with the Spotted Webworm at Washington, D.C. The species is recorded by Marsh as attacking table and sugar beets, stock beets or mangel-wurzels, and several other cultivated and wild plants. The only parasite observed was a single Braconid (*Hemiteles* sp.). The author says that injury was discovered too late for the application of insecticides and suggests that the remedies used against the Hawaiian Beet Webworm will probably prove effective.

A brief bibliography concludes the bulletin.

DURRANT (J. H.) & BEVERIDGE (Lt.-Col. W. W. O.). **A Preliminary Report of the Temperature reached in Army Biscuits during Baking, especially with reference to the Destruction of the Imported Flour-moth, *Ephestia kühniella*, Zeller.**—*Jl. Roy. Army Med. Corps, London*, xx, no. 6, June 1913, pp. 615-634, 7 plates.

For some time past it has been observed that ration biscuits exported to the colonies have, after a time, become quite unfit for consumption owing to the ravages of certain moths and beetles. This has been especially noticed in South Africa, Ceylon, Gibraltar, Malta, Mauritius, and the Sudan. This enquiry was undertaken in order to ascertain: (1) how and when infestation of biscuits takes place; (2) whether any steps can be taken to avoid, or minimise such infestation.

The insects met with during this inquiry are all widely distributed species, whose range has been doubtless greatly extended by commerce. All are known to occur in England.

*Injurious Insects.*

LEPIDOPTERA: *Ephestia kühniella*, Z., *E. cautella*, Walk., *E. elutella*, Hb., *Corcyra cephalonica*, Stn.

COLEOPTERA: *Silvanus surinamensis*, L., *Trogoderma* sp., *Sitodrepa panicea*, L., *Lasioderma serricorne*, F., *Rhizopertha dominica*, F., *Ptinus tectus*, Boiel., *Tribolium castaneum*, Hbst., *T. confusum*, Duv., *Tenebrioides mauritanicus*, L., *Calandra oryzae*, L., *C. granaria*, L.

*Beneficial Insects.*

HYMENOPTERA: *Bracon brevicornis*, Wesmael.
COLEOPTERA: *Tenebrioides mauritanicus*, L.

All the above species were obtained from tins of biscuit, with the exception of *Ptinus tectus*, *Trogoderma sp.*, *Gnathocerus*

...atus and *Calandra granaria*, which were found amongst loose material, such as flour and grain, and might be expected to occur in the tins. No trace was noted of the moths *Pyralis farinalis*, L., *Plodia interpunctella*, Hübn., *Sitotroga cerealella*, Ol., or *Tinea granella*, L., or the beetles *Palorus melinus*, Hbst., and *Latheticus oryzae*, Waterh.

With a view to determining the origin of infestation, sample tins were withdrawn from stocks at various stations abroad for inspection at Woolwich by experts, and tins which, after careful examination, had been pronounced intact, were found to contain *Ephestia kühniella*, etc., in various stages of development, proving conclusively that infestation had taken place in the factories before the tins were soldered and showing that preventive or remedial measures must be taken in the factories themselves. The following considerations present themselves: either, the heat of the biscuit in the process of baking is insufficient to destroy ova present in the moist dough, or moths and beetles deposit their ova in or on the biscuits after baking and during the process of cooling or packing the tins. Cooling before packing is necessary to allow the moisture in the centre of the biscuit to become evenly distributed, and it is during this cooling process that the biscuit is exposed to the greatest risk of infestation.

The flour as received is often infested by insects in various stages, and it has been suggested that the heat of baking is not sufficient to sterilise the interior of the biscuit, and some attempt has been made during these investigations to determine exactly what occurs. A somewhat complicated themo-electrical apparatus was used by the authors to determine the interior temperature of biscuits during the process of baking, and this is carefully described. They found that ova which had been exposed to a temperature of 69° C. for twelve minutes, failed to survive, and that the temperature of the interior of a biscuit reached 100° C. and more. The authors think it exceedingly unlikely that the ova can withstand the temperatures reached and maintained during the process of baking, and they are, therefore, of opinion that infestation must take place after baking, during cooling, and prior to the tins being soldered.

They have considered the practicability of destroying insect life after packing by puncturing the biscuit tins before leaving the factory, raising the temperature to a lethal point and then resoldering. There are, however, technical difficulties and also the question of added expense.

Until the temperature destructive to the ova of the moth *Ephestia kühniella* (which may be considered as representing other species) has been actually determined, the only practical suggestions which the authors can offer are that the temperature conditions during cooling should be rendered as uncomfortable as possible for the moths, by introducing screened cooled air which should be continually withdrawn by revolving fans, suction or some other similar contrivance. They think this would more rapidly cool the biscuits and also render it practically impossible for the moth to oviposit on them. It is also suggested

that the attention of the Board of Agriculture should be drawn to the advisability of protecting the Trade by scheduling *Ephestia kühniella*, *Corcyra cephalonica*, and perhaps other species also.

The authors conclude their paper with an historical account of *Ephestia kühniella* and its distribution, and come to the conclusion that this species has probably been introduced into Europe and the United States from Central America.

The authors say that the species of Lepidoptera which most seriously infest army biscuit are *Ephestia kühniella*, Z., and *Corcyra cephalonica*, Stn., but *Ephestia elutella*, Hb., and *Ephestia cautella*, Walk., have been found almost equally destructive to some samples. It would seem that *Corcyra cephalonica* is a less serious pest than *Ephestia*, for if the percentage of moisture present in the biscuit be considerably reduced, the young larvae of the *Corcyra* are unable to bite the dry biscuit and die of starvation—this has not been found to be the case with *Ephestia*.

The paper is illustrated by very excellent plates and contains popular and scientific descriptions of these species with full references to the literature. A list of parasites bred from *E. kühniella* is also given.

Vermorel (V.) & Dantony (E.). **Préparation des Bouillies Alcalines Mouillantes.** [Preparation of alkaline sprays of high wetting power.]—*Progrès Agricole et Viticole*, xxx, 15th June 1913, pp. 745-746.

The authors give the following recipes in response to numerous requests for information as to the preparation of alkaline spray mixtures depending for their wetting power upon the addition of casein.

*Bordeaux Mixture.* Solution (A): Dissolve 4½ lb. of sulphate of copper in 20 gallons of water. Solution (B): Slake 2 lb. of good stone lime slowly and carefully with a small quantity of water; carefully stir into 2 gallons of water, so as to obtain a homogeneous milk of lime. This mixture is to be poured gradually and with constant stirring into the solution (A) and tested continually with test paper; as soon as the test paper becomes blue the addition of milk of lime must be stopped. In order to increase the wetting power of this mixture 2 pints of solution of casein is to be added. This solution is prepared as follows:—2 oz. of quicklime in fine powder and 1 oz. of casein in dry powder to every pint of water: thoroughly mix the quicklime and casein in a mortar and add sufficient water to form a paste, then stir in the rest of the water.

*Burgundy Mixture* (A): Dissolve 4 lb. of sulphate of copper in 2 gallons of water. (B) Dissolve 2 lb. of washing soda in 2 gallons of water. Pour (B) into (A) very slowly, stirring it vigorously all the time; as soon as the mixture is alkaline to test paper no more soda solution should be added. Make up to 20 gallons and add 2 pints of the solution of casein made as follows:—Dissolve 4 oz. of carbonate of soda in 2 pints of water; then mix 2 oz. of casein in fine powder with sufficient of this

solution to form a smooth paste, the remainder of the solution being added gradually in a mortar with constant stirring until the casein is thoroughly incorporated. The action proceeds more rapidly if the liquid is slightly warm. This mixture occasionally causes burning of the leaves.

Acid mixtures can have their wetting power increased by the addition of ½ to 1½ oz. of gelatine to every 20 gallons; the gelatine should be first disssolved in a quart of boiling water. Casein cannot be used with acid mixtures.

PÉNEAU (J.). **Coléoptères de la Loire-Inférieure.**—*Bull. Soc. Sci. Nat. de l'Ouest de la France, Nantes*, iii, no. 1, 31st March 1913, pp. 25-85, 1 pl.

An account of the Coleoptera of the Département of the Loire-Inférieure, containing remarks on numerous species of economic interest.

KIEFFER (Dr. J. J.). **Glanures diptérologiques.** [Dipterological gleanings.]—*Bull. Soc. d'Hist. Nat. de Metz*, (3) iv, no. 28, 1913, pp. 45-55.

As the title implies, this paper consists of miscellaneous notes, systematic and bionomic, on new Diptera. Of economic interest are the descriptions of *Phaenobremia cardui*, sp. n., preying on *Aphis cardui*, at Bitsch, Lorraine, and *Monobremia subterranea*, sp. n., preying on an *Aphis* which lives on the roots of *Tanacetum vulgare*, at Bitsch, Lorraine.

HERRICK (G. W.). **The Asparagus Miner and the Twelve-spotted Asparagus Beetle.**—*Agric. Expt. Station, Coll. Agric., Cornell Univ.*, Bull. 331, April 1913, pp. 411-435, 7 pls.

The Asparagus Miner is a native of America and closely resembles the Asparagus Fly of Europe, *Platyparea poeciloptera*, Schrank, which, however, is a borer and not a miner. Records of outbreaks are given, the insect being widely distributed in the eastern part of the United States, and in fact wherever asparagus is grown to any considerable extent, especially in New York, New Jersey, Pennsylvania, Maryland, Connecticut, Massachusetts, Long Island, District of Columbia, Tennessee, Virginia, and throughout California. The presence of the insect, and especially of its larva, is never very evident to the casual observer, unless the adult flies are congregated on the stalks and branches, but as no injury is apparent from their presence they are easily mistaken for visitors rather than recognised as pests. If a stalk that looks yellow at the base is pulled out, it will be found that the skin peels off very easily or is cracked, and if the observer traces some of the mines he will find in most cases a white maggot beneath the epidermis of the stalk. This yellowing of the stalk at the base, or the shrivelled appearance and premature yellowing of the entire plant, is a sure indication that the Asparagus Miner is present.

In one bed over 80 stalks were examined, and at least 3 puparia were found on every stalk, and as many as 12 on some. The adults appear in the spring and immediately begin to lay eggs on volunteer plants or in seedling beds, no attempt being made to oviposit on cutting beds. The egg, larva, pupa and adult are described and figured, and a table of the life-cycle is given. There are two broods in the year, adults appearing in the second half of May and laying eggs which hatch about the middle of June. The larvae pupate in July, and the second brood emerges about the end of the month. The pupae of the second generation remain over the winter to reappear in May of the next year. These facts apply to the neighbourhood of Ithaca, New York.

Flies were found to be killed by spraying with a solution of 1 part of potassium arsenate to 45 parts of water, with 12 lb. of syrup added. A mixture of 2 lb. arsenate of lead to 50 gallons of water and 12 lb. of syrup also proved effective against flies, but was slower in its operation. The author considers that spraying with tobacco extract (Black Leaf 40) in the proportion of 1 to 500, with an addition of 4 lb. of soap, is the best remedy against the larvae. A bibliography is given.

*Crioceris duodecimpunctata*, L. (Twelve-spotted Asparagus Beetle) was imported from Europe, though at what date is not known, and was first observed near Baltimore in 1881. Some account is given of its progress and distribution throughout the United States.

In the early spring the hibernating beetles begin to attack the young asparagus shoots in the same manner as *Crioceris asparagi*. Observations made at Ithaca failed to show any attack on cutting beds, though the beetles were found in large numbers on volunteer plants growing near a cutting bed. When the cutting season is over and the shoots have begun to branch out, the beetles feed mainly on the stalks and branches, gnawing the epidermis, and even the larger branches are entirely destroyed by them. Later, they feed to a large extent on the blossoms and berries. Egg-laying does not take place until after the asparagus plants have either blossomed or begun to form berries. The eggs are laid on the branches and hatch out in from 7 to 12 days. The larvae feed only on the berries, and after the second moult a larva can eat the entire contents of a berry within twenty-four hours or less, and before completing its growth it may destroy as many as four berries. This is a cause of serious loss to seed-growers. The larvae become mature in a week or 10 days. Pupation lasts from 12 to 20 days, and in the neighbourhood of Ithaca adults emerge about 20th July. Second brood eggs are laid about 1st August, and the larvae hatch out about 9th August. The author suggests as remedies—although no experiments were conducted—spraying the berries with arsenate of lead as soon as they are formed, so as to poison the larvae at their first meal, but thinks that spraying with arsenate of lead 2 lb., water 50 gallons, with the addition of 2 to 4 lb. of soap, or of 12 lb. of syrup when the Asparagus Miner is present, will effectively destroy the beetles before they have had a chance to deposit their eggs.

A lengthy bibliography from 1758 to 1910 concludes the article.

CROSBY (C. R.). **A Revision of the North American Species of *Megastigmus* Dalman.**—*Annals Entom. Soc. Amer., Columbus, Ohio*, vi, no. 2, June 1913, pp. 155-170, 10 figs.

So far as known, the larvae of all North American species of *Megastigmus* (CHALCIDIDAE) live in the seeds of plants:—*M. aculeatus*, Swed.—rose seeds; *M. albifrons*, Walk.—seeds of *Pinus ponderosa*; *M. brevicaudis*, Ratz.—seeds of *Sorbus*; *M. borriesi*, Crosby—seeds of *Abies mariesi* from Japan; *M. flavipes*, Ashm.—unknown; *M. lasiocarpae*, Crosby—seeds of *Abies lasiocarpa*; *M. nigrovariegatus*, Ashm.—rose seeds; *M. physocarpi*, Crosby—seed capsules of *Physocarpus opulifolius*; *M. pinus*, Parfitt—seeds of *Picea bracteata*, *Abies nobilis*, *A. magnifica*, *A. grandis*, *A. concolor*, *A. amabilis*; *M. spermotrophus* Wachtl—seeds of *Pseudotsuga taxifolia*, *Abies magnifica*, *A. grandis*, *A. amabilis*, *A. concolor*; *M. tsugae*, Crosby—seeds of *Tsuga mertensiana hookeriana*.

DE SALAS Y AMAT (L.). **Les plagas del naranjo y limonero en España.** 1912, 196 pp., 8 figs. [Scale Insects injurious to Orange and Lemon in Spain.]—*Mthly. Bull. Agric. Intell. & Plant Diseases, Rome*, iv, no. 6, June 1913, p. 968.

The author gives the following list of the chief scale-insects of orange and lemon in Spain:—*Chrysomphalus dictyospermi* var. *pinnulifera*, in Valencia, Tarragona, the Balearic Isles, Murcia and Andalusia; *Aspidiotus hederae*, at Valencia and in Andalusia; *Parlatoria zizyphi*, at Valencia; *Lepidosaphes beckii* (*Mytilaspis citricola*), at Valencia and in Andalusia; *L. gloveri* and *Pseudococcus* (*Dactylopius*) *citri*, at Valencia and in Andalusia; and *Saissetia oleae*.

DAY (F. H.). ***Bostrichus capucinus*, L., in Cumberland.**—*Entom. Monthly Mag., London*, June 1913, p. 136.

Last July and August the writer found a number of specimens of *Bostrichus capucinus* in an oak log, imported from Odessa in a roughly hewn state, but with the whole of the bark removed. The beetles were captured as they emerged from their cleanly cut burrows in the hard, perfectly sound wood. The author believes it is many years since this species was found really wild in Great Britain and suggests that the specimens may have originated from similarly imported parents.

DUBOIS (Dr. A.). **Oiseaux et insects au point de vue écohomique.** [Birds and insects from an economic point of view.]—*Bull. Soc. Zool. de France, Paris*, 1913, xxxviii, no 5, 27th June 1913, pp. 165-172.

This is a discussion of the results of a recent limited investigation into the food of wild birds in Belgium. The stomach contents of 231 insectivorous birds, referable to 18 species, were

examined, and it was found that only 7 species had eaten injurious insects. The author concludes that the importance of birds in this direction has been much over-estimated, and insists that parasitic and predaceous insects are of far greater value to the farmer and forester.

[It must be noted that for the great majority of species the number of stomachs examined is far too small to permit of reliable generalisations.—Ed.].

GIBSON (A.). **Flea-Beetles and their Control.**—*Dom. Canada Dept. Agric., Dir. Entom.*, Entom. Circ. no. 2, Ottawa, 1913, 11 pp., 14 figs.

The Spinach Flea-beetle (*Disonycha xanthomelaena*, Dalm.) is fairly abundant in some seasons in Ontario and Quebec, but no serious complaint has been received as yet of damage to spinach or beet crops, which are attacked by it in the United States.

The Triangle Flea-beetle (*Disonycha triangularis*, Say) was especially destructive to beet some years ago in Ohio, Michigan, and elsewhere in the United States. It is common in Canada, but as yet can hardly be regarded as a pest.

The Alder Flea-beetle (*Haltica bimarginata*, Say) has been occasionally reported as injuring alder, poplar and willow. It is known all over Canada, from Nova Scotia to British Columbia and as far north as Fort Simpson on the McKenzie River.

The Grape Vine Beetle (*Haltica chalybea*, Ill.) attacks the tender buds of grape vines, which are often completely eaten, and occasionally the vines are killed. Grape-growers in Ontario have at times suffered serious loss. The eggs are laid in cracks of the bark, at the base of the bud, in cavities in the buds or even on the leaves themselves. The grubs hatch about the time the leaves expand, are full-grown in three or four weeks, and pupate in the ground, the beetles emerging in a week or two. As the beetles pass the winter beneath dead leaves and other rubbish, this should be carefully collected and burnt in autumn. The vines should be watched when the buds are forming and if the insects are present they should be heavily sprayed with Paris green or arsenate of lead. The author says that the buds will stand 1 lb. of Paris green in 75 gals. of water to which 1 lb. of freshly slaked lime has been added. The application should be renewed in a few days, or sooner if rain has fallen. Arsenate of lead has been used with success of a strength of 8 lbs. to 36 gals. of water. When the beetles are feeding on the leaves, the strength of the spray should be reduced to, Paris green 1 lb., water 160 gals.; or arsenate of lead 2 lbs., water 40 gals. This insect also attacks Virginia creeper.

The Strawberry Flea-beetle (*Haltica ignita*, Ill.) has done serious damage in the United States to strawberries, grapes and peaches. It was reported in 1910 as damaging strawberries at Nelson, B.C. The author thinks, however, that this is an error and that the species was *H. evicta*, Lec. The only record of injury by *H. ignita* in Canada was in 1910 at St Stephen, N.B.

The Bronze Flea-beetle (*Haltica evicta*, Lec.) appears to be constantly confused with the previous species and was wrongly reported as damaging turnips and cabbages at Half Way Lake, Alta, in 1911. In this case the species was *H. ignita*.

The Potato Flea-beetle (*Epitrix cucumeris*, Harr.) is one of the most destructive of the flea-beetles occurring in Canada, eating the leaves of potato and tomato, cabbages, cucumbers, beans, tobacco, squashes, pumpkins, wonder-berry and other plants. They are most numerous in hot, dry seasons. The pest has been reported from Ontario and from Vancouver. The beetles winter in dry sheltered spots, and the eggs are laid on the roots of solanaceous weeds on which the larvae feed and pass the pupal state. Serious damage is done at the end at July or early in August.

The Red-headed Flea-beetle (*Systena frontalis*, F.) is very numerous in Ontario and other Eastern provinces. Its food-plants are very numerous, but it is particularly destructive early in the season to the leaves of potatoes, beans, young grapes and many varieties of deciduous shrubs. At Ottawa and Guelph they have damaged clover, and at Bryanston they have been found in corn fields, but the chief damage was done to mangel-wurzel.

The Black-margined Flea-beetle (*Systena marginalis*, Ill.) is occasionally recorded in Eastern Canada and considerable damage is done to certain forest and shade trees. At Ottawa the worst attack has been in August when the beetles destroy the leaves of elm, oak and hickory, and in one outbreak the leaves of the Service Berry (*Amelanchier canadensis*) were freely eaten.

The Pale-striped Flea-beetle (*Systena blanda*, Mels.). In the United States this species frequently requires control as it damages corn, strawberry, melon, potato, carrot, beet, clover, etc. It is not recorded as having done serious damage in Canada though there have been small serious local outbreaks.

The Turnip Flea-beetle (*Phyllotreta vittata*, F.) is one of the commonest flea-beetles which attacks vegetables. The beetles pass the winter as adults and in the latter half of May and throughout June do great damage to young cruciferous plants, chiefly to the seedlings. There are two or three broods during the season and the species occurs generally throughout Canada.

The Horse-radish Flea-beetle (*Phyllotreta armoraciae*, Koch) was found in Chicago in 1893 and since then has been found at other places in the United States and in Canada. It was abundant and did great damage to horse radish at Montreal in 1912, this appearing to be the only cultivated crop seriously attacked.

The Hop Flea-beetle (*Psylliodes punctulata*, Melsh.) has cost the British Columbian hop-growers large sums of money. The beetles pass the winter in the trellis poles, under rubbish or under the surface of the soil. They become active in the end of March and throughout April, and in British Columbia there are two distinct broods in the year. The over-wintered females lay their eggs in spring and the beetles appear mostly in early June; the second generation in the end of July and throughout August.

A tarred board, or canvas stretched over a light wooden frame, 4 ft. long by 3 ft. wide, coated with tar and trailed through the gardens will, it is said, catch 85 per cent. of the beetles present. Tanglefoot bands may also be used after the hop vines have been trained.

The author gives the following chief methods of control: Bordeaux mixture or Paris green ¼ lb. to 40 gals. of water, with ½ lb. freshly slaked lime. Arsenate of lead 2-3 lbs. to 40 gals. of water or both these arsenical compounds in the above strength in combination with Bordeaux mixture. In the case of the Potato Flea-beetle Bordeaux mixture gives satisfactory results; when the number of beetles is great it may be necessary to spray twice a week or even oftener. Paris green 1 lb., mixed with 20 lbs. of land plaster, and dusted on to the plants early in the morning while they are still wet with dew is a good remedy. The land plaster stimulates the plants and the Paris green kills the beetles. This remedy is particularly useful against the Turnip Flea-beetle. In the case of cabbages it is inadvisable to use arsenical mixtures after the heads of the plants are half formed. The author advises the addition of 2 lbs. of resin, 1 lb. washing soda and 1 gal. of water, well boiled together, to 40 gals. of the spray above mentioned in order to secure better adhesion.

Tomatoes and such plants may be protected by dipping the tops only, when planting out, in 1 lb. arsenate of lead in 10 gals. of water. Beds of radishes screened by cheese-cloth covers are well protected against flea-beetles and root maggots. These may be made by cutting a barrel hoop in two, sticking the ends in the ground and stretching the cheese cloth over the intervening space; the sides which touch the ground should be covered with earth so as to close entrances which might admit the beetles. Larger frames with 6 or 8 inch boards with galvanised wires stretched across are in use in New York State and are found effective. In 1909 in British Columbia good results were obtained against the Hop Flea-beetle by spraying with whale-oil soap 1 lb., water 5 gals. Unfortunately if the beetles are abundant, constant and regular treatment of such a quickly growing crop by this means is prohibited on account of the cost, as it would have to be applied every 24 hours.

Late sowing is said to be an excellent remedy against the Turnip Flea-beetle and in central Ontario the third week in June is the best time to sow in order to avoid injury; the crops are said to be quite as good as when sown three weeks earlier.

The fact that the larvae of these flea-beetles feed upon the roots of common weeds renders clean culture very necessary, and if weeding is done about the middle of July large numbers of the grubs will be destroyed. Weeds on the margins of fields should be kept down and it is well to use land infested by such weeds for such crops as are not attacked by the adult flea-beetle. The thorough cleaning of the land after a crop is also very essential as the beetle is thus to a large extent deprived of the means of hibernation.

CHAPAIS (J. C.). **Un ancien ennemi de la pomme de terre.** [An old enemy of the potato.]—*Le Naturaliste Canadien, Quebec,* xxxix, no. 10, April 1913, pp. 149-153.

In this paper the author discusses those members of the family MELOIDAE which attack the potato, but says that out of 16 known species only three are to be regarded as pests in the province of Quebec. These are *Epicauta cinerea, E. pennsylvanica* and *Macrobasis unicolor* (Ash-grey, Black, and Grey Blister Beetles respectively). These beetles lay their eggs in summer on the surface of the soil and the author gives a brief description of their metamorphosis. They generally live in large swarms, remaining but a short time in one place, and in the course of two or three days a swarm of these beetles is capable of completely defoliating a considerable crop of potatoes or tomatoes. The following is recommended as a remedy to be applied immediately that any of the beetles are seen on the crops: Sulphate of copper 2 lb., quick lime 4 lb., Paris green 4 oz., water 40 gals.: to be used as a spray. The author says that it is also possible to drive the beetles away by causing boys armed with branches to walk through the crop, brushing the plants with these as they go; the beetles in this way can be driven to one side of the field along which a line of loose straw has been placed; the insects are driven to this and it is then set on fire.

In the larval stage these insects penetrate into the oothecae of Orthoptera and eat the eggs, especially those of the Red-legged Grasshopper (*Caloptenus femur-rubrum*), and to this extent they are useful, for this insect causes much damage.

FULLER (Claude). **A New Sugar-Cane Pest.** *Agric. Jl. Union of South Africa,* v, June 1913, pp. 931-933.

The author was informed by telegram that 12,000 acres of cane on the Natal Estates, Mount Edgecombe, had suddenly been attacked by a grub and that every individual cane-top had a grub in it, irrespective of the age of the cane. He found that this pest was the caterpillar of a moth, which webbed together the immature leaves forming the spike of the cane and was feeding upon the inner surface of the outermost leaf of the spike, making numerous parallel grooves in the leaf-surface. The caterpillars showed no tendency to work downwards towards the growing point of the spike or to eat through the leaves. The author arrived at the following conclusions: (1) 99 per cent. of the spikes of the "Uba" cane were infested; (2) only in rare cases was more than one caterpillar found within a spike; (3) the varieties of cane known as the "Black Seedling" and "Green Cane" were practically immune, no matter how closely planted to grossly infested areas of "Uba"; (4) individual stools of "Uba" standing in blocks of sweet cane were attacked and the sweet cane was not touched.

The author is of opinion that the damage done was not very serious although he recognises that the destruction of a certain amount of leaf tissue and the delayed activity of the enfolded

leaves is detrimental to the plant, but this he says is of such minor importance that it may be safely disregarded. The insect's chief influence is to prevent the normal unfolding of the leaves from the spike, but the growth of the plant is always sufficiently strong to cause the spike to open and break away the caterpillar's web. He found that when this occurred the caterpillar shifted to the next leaf sheathing the spike. The sweet canes are slightly attacked, and owe their comparative freedom to the nature of their growth, as they do not form so long and enfolded a spike as does the wilder "Uba." The leaves are less easily woven together and do not lend themselves to the insect's habits; further they are stronger and tear away the webs of the caterpillar very easily. Poison is out of the question, and as to cutting out the infested spikes, the author regards this as wanton destruction of 90 per cent of the leaf-surface of the plant. The damage done in his opinion can be safely regarded as only 10 per cent. of the potential foliage. He discusses the cost of this cutting out over the whole estate attacked and endeavours to show that the loss would far outweigh the doubtful gain.

TAYLOR (H. W.). **The Production of Bright Tobacco by the Flue and Air Curing Processes.**—*Agric. Jl. Union of South Africa*, v, June 1913, pp. 880-909.

The author after dealing at length with technical agricultural and other processes concerned in the growth and preparation of tobacco, makes the following remarks on some of the more important insect pests of the plant in the Transvaal.

The Split Worm (*Phthorimaea operculella*) does most injury in the seed beds. Arsenate of lead 1 oz., in 16 gals. of water (or one large tablespoonful to 2 gals. of water) is recommended as a spray. The poison to be first thoroughly suspended in about a quart of water and this made up to 2 gals.; when properly prepared the mixture should somewhat resemble milk. When the spraying is complete and the plants dry they should have the appearance of having been whitewashed. If the larvae have entered the stems the plants should be destroyed. For Cutworms (NOCTUIDAE) the usual poisoned bait is recommended. Wireworms (ELATERIDAE [? TENEBRIONIDAE]) enter the stalk at the surface of the soil, burrowing downwards inside it and destroying the plant. The author is not aware of any useful remedy, but thinks that winter ploughing might diminish their numbers. The attack is more serious in dry seasons than in wet. The Bud Worm (*Heliothis rhexia*).* The principal injury done in the Transvaal by the larvae of this insect is to the seed-pods, but they also attack the buds just before the flower-head appears. In preparing the seed-head for the reception of the paper bag, with which it is usually covered to prevent cross-fertilisation, any eggs found should be destroyed or the heads should be sprayed with arsenate of lead.

* [*Chloridea virescens*, F. (*rhexia*, S. & A.) is a purely American species; the insect referred to is probably *C. obsoleta*, F.—Ed.]

FULLER (Claude). **The Wattle Bagworm.**—*Agric. Jl. Union of S. Africa*, v, no. 6, June, 1913, pp. 838-855, 3 figs., 2 maps.

This insect (*Chaliodes junodi*, Heyl.) is a native of South Africa, and its natural food-plants are several species *Acacia*; it is widely spread in the Cape, Transvaal, and Natal. Attention was called to it by C. P. Lounsbury in the "Cape Agricultural Journal" of February 1899, and the author mentioned it as of more or less importance in nearly every wattle plantation in Natal in 1899 and 1900. Subsequent to 1900, cultivation of the wattle (*Acacia mollissima*) extended very rapidly, the area under cultivation in 1912 being ten times that in 1908. In 1909 it was reported that the pest was no worse than 12 years before, though occasionally assuming alarming proportions, but recent outbreaks in Natal have given rise to apprehension, and the increase of wattle cultivation has given the bag-worm great opportunity for extending its range. It shows great adaptability to new environments and new hosts, and may be found from very near sea-level up to altitudes of 5,000 feet, and it will readily consume guava, rose, blackberry, oak and apple, as well as the Australian acacia. Its eradication is regarded as impracticable, and all that can be done is to keep it in check and prevent its spread, though the author says that unfortunately the measures that might be taken are to a large extent impracticable to wattle-growers. Natural checks are of very great importance, large numbers being destroyed by spiders and insects before a bag is made; many are carried away by the wind; fungus pests and insect parasites assist in keeping it down, and it is largely preyed upon by the White-nosed Rat (*Mus concha*, A. Smith). Serious infestation is said not to occur until after the fourth year of growth, and there is some reason for supposing that the wind plays a part in carrying the caterpillars from one plantation to another. The author describes the elevation of the land and the general physical and climatic features of Natal at some length, and he is of opinion that in certain districts where infestation is not serious the moist warm atmosphere and the consequent ready development of bacteria and fungi has much to do with keeping the pest in check. The question of whether the bag-worm is more abundant in a dry or a wet season is difficult of decision, but the weight of evidence appears to show that dry seasons favour it.

BIGGLESTONE (H. C.). **A Study of the Nesting Behaviour of the Yellow Warbler** (*Dendroica aestiva aestiva*).—*Wilson Bulletin, Oberlin, Ohio*, no. 83, xxv, no. 2, June 1913, pp. 49-67.

Between 2nd July and 12th July 1912, the feeding of three nestlings of the Yellow Warbler was observed. During that time the parents made 2,373 feeding visits to the nest, bringing, amongst other articles of food, 659 green larvae, 326 fly maggots, 147 mayflies, 103 moths, 75 millers, 65 mosquitos, 26 larvae, 25 grasshoppers, 23 spiders, 18 ants, 14 grubs, 8 beetles, 4 dragon flies, 2 tree hoppers, 1 bee and 553 miscellaneous insects.

## Notices of Entomological Appointments, &c.*

Mr. R. H. Deakin has been appointed as Assistant Entomologist at Nairobi, East Africa Protectorate.

Dr. A. D. Imms, late Forest Zoologist to the Government of India, has accepted a post in the University of Manchester for research work in Economic Entomology.

Mr. F. P. Jepson, Government Entomologist of Fiji, left Java in July, having been there to search for parasites of the Banana Weevil (*Cosmopolites sordidus*, Germ.).

Dr. W. A. Lamborn has been appointed as Entomologist to the Department of Agriculture, Southern Nigeria, in the place of Mr. A. Peacock (invalided).

Mr. Gilbert Storey has been appointed as Assistant Entomologist to the Egyptian Department of Agriculture.

The appointment of Mr. F. W. Urich as Entomologist to the Board of Agriculture has been renewed for a further period of two years.

The vacant Carnegie Scholarships of the Imperial Bureau of Entomology have been allotted to the following gentlemen:—Mr. R. E. McGregor, Trinity College, Cambridge, for two years; Mr. A. R. Ritchie, Glasgow University, for two years; Mr. C. Mason, South-Eastern Agricultural College, Wye, for one year; and Mr. J. W. Tothill, Assistant Entomologist, Dominion of Canada, for six months.

The Sleeping Sickness Commission of the Royal Society have arranged to send Mr. W. F. Fiske (lately of the U.S.A. Bureau of Entomology) to East Africa in September, for the purpose of studying the bionomics of *Glossina*.

* Under this heading it is proposed to publish from time to time information with regard to the appointment or movements of Economic Entomologists throughout the British Empire. It is hoped that any Entomologists concerned will be good enough to send an early notification to the Editor.

JONES (Lynds). **Some Records of the Feeding of Nestlings.**—*Wilson Bulletin, Oberlin, Ohio.* no. 83, xxv, no. 2, June 1913, pp. 67-71.

Four nestlings of the field sparrow (*Spizella pusilla pusilla*) were observed during a period of more than nineteen hours to receive 237 pieces of food which comprised 154 Geometrid larvae, 45 grasshoppers and 24 moths. The food was secured within a radius of 50 yards of the nest, mostly from the grass of the orchard, but occasionally from apple trees.

Four nestlings of the song sparrow (*Melospiza melodia melodia*) received 300 pieces of food of which 178 were Geometrid larvae, 46 grasshoppers, 11 bugs, 3 moths and 31 unknown.

Of 637 pieces of food brought to the nestlings of the house wren (*Troglodytes aëdon aëdon*) 161 were Geometrid larvae, 141 leaf-hoppers, 112 young grasshoppers, 56 bugs, 42 spiders, 29 crickets, 10 moths, and 5 ants.

BURRILL (A. C.). **Quails as Insect Eaters.**—*Wilson Bulletin, Oberlin, Ohio,* no. 83, xxv, no. 2, June 1913, pp. 99-100.

In a letter to the editor of the Wilson Bulletin the writer says that the quail should become a farm bird, as it eats about five pounds of insect pests and 9·75 lbs. of weed seeds yearly, a work valued at from $10 to $20 a year per bird. Wisconsin's quail were being shot for game when they were most needed to help to save the wheat crop from entire collapse in the chinch bug epidemic of the early seventies. A single quail has eaten 5,000 chinch bugs at a meal. The annual loss in Wisconsin owing to insects is estimated at from $13,000,000 to $40,000,000. The value of birds and insectivorous animals slaughtered in Wisconsin in 1912 was $1,000,000, and already the bird population in this State is at least 20 per cent. less than it was.

COLLINGE (W. E.). **The Food of some British Wild Birds: A Study in Economic Ornithology.** Dulau & Co., London, 1913, 109 pp. 8vo. Price 4*s*.

At a time when increasing attention is being paid to the economic value of birds, a book which not only sums up previous records—there are 114 references in the bibliography—but sets forth in considerable detail the results obtained from observations both in the field and in the laboratory extending over the past eight years, must be welcomed. In all, the author made 3,048 post-mortems of adult birds, 312 post-mortems of nestling birds, and also examined large quantities of faeces and pellets; twenty-nine species of British wild birds were examined; of these, five are distinctly injurious, *viz.*, the house-sparrow, bullfinch, sparrow-hawk, wood-pigeon and stockdove; six are too plentiful and consequently injurious, *viz.*, missel-thrush, blackbird, green-finch, chaffinch, starling and rook; one is injurious but not plentiful, *viz.*, the blackcap; the jay is to be regarded as neutral,

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and the remaining sixteen are beneficial, especially the owls, the wren and the plover. To take an example of the author's method of setting forth his results: The Blue Tit (*Parus coeruleus*) is discussed, with references to previous authors. The post-mortem records (38) in tabular form show the following benefits: Aphids occurred 6 times, scale-insects 16, apple-blossom weevil (*Anthonomus pomorum*) 3, fragments of beetles 7, fragments of lepidopterous larvae 20, fragments of Tineina 3, fragments of dipterous larvae 4, and gall-making insects (*Cynips*, etc.) 8 times. Injuries were: fruit pulp 7, fragments of wheat 4, fragments of bud-scales 5, and particles of apple rind 3 times. Neutral: fruit of birch 4, bits of grass 1, miscellaneous vegetable matter 6, and spiders 4 times. Then field observations, food of nestlings and the examination of faeces are discussed, and each record ends with a conclusion; in this case: "In spite of all that has been chronicled against this bird, I am of opinion that it is distinctly beneficial. The harm it does is comparatively insignificant when compared with the great benefits it confers." The relation of wild birds to forestry is briefly reviewed, and the subjects of bird protection and legislation are discussed. In clearly defining the precise economic position of the species of birds dealt with, the author has rendered a service not merely to the ornithologist, but to the economic entomologist as well.

Dyar (H. G.). **A Galleriine Feeding in Cacao Pods.**—*Insecutor Inscitiae Menstruus, Washington, D.C.*, i, May 1913, p. 59.

Two males and one female of *Tineopsis theobromae* g. n., sp. n., were bred from 'cacao beans' on the Pennsylvania Chocolate Company's premises at Pittsburgh, Pa., 8th January 1913.

Chatton (E.). **Septicémies spontanées à Coccobacilles chez le Hanneton et le Ver-à-soie.** [Septicaemia in the Cockchafer and Silkworm due to *Coccobacillus*.]—*C.R. Acad. Sci., Paris*, clvi, no. 22, 2nd June 1913, pp. 1707-1709.

At the suggestion of Dr. Roux, the author, in May 1912, experimented with *Coccobacillus acridiorum*, d'Hérelle, on cockchafers. The latter, if inoculated with the virus into their body cavity, died in from 24 to 48 hours. After a series of ten successive inoculations the virus was intensified so as to kill the cockchafer in between 12 to 24 hours. Females are generally more resistant than males. Contrary to d'Hérelle's experience with locusts, the cockchafers could not be infected with the virus by the mouth. From the beginning of the experiments the author noted a septicaemia independent of the *Coccobacillus acridiorum*, due to a specific organism, *Bacillus melolonthae*, which resembles that of d'Hérelle, but differs from it in being slightly longer and showing a fluorescence in the culture medium after 5 to 6 days. Up to 0·5 cc. of *C. acridiorum* injected into the general cavity of silk-

worms showed that the latter are by nature immune. *B. melolonthae* behaves in the same way in the silkworm as in the cockchafer, being virulent when injected and innocuous when taken into the alimentary canal. Further, a new bacillus, *B. bombycis*, was discovered in the silkworm, producing a daily mortality from septicaemia of from 5 to 10 in a generation of 2,000 silkworms. This microbe resembles *B. melolonthae* morphologically, but differs in the physiological character of not imparting a fluorescence to the culture jelly and in being more virulent than the two other species. *B. bombycis* seems less frequent in the alimentary tract of the silkworm than *B. melolonthae* in that of the cockchafer. The disease produced by *B. bombycis* in silkworms has hitherto escaped recognition. No external symptoms are noticed before death and the coccobacillosis, as the author terms the disease, is essentially different from the well-known flacherie and grasserie.

ESSIG (E. O.). **The Yerba Santa Mealy Bug** (*Pseudococcus yerba-santae*, **sp.n.**).—*Jl. of Entom. & Zool., Claremont, Cal.*, v, no. 2, June 1913, pp. 85-87, 2 figs.

This Mealy-Bug feeds upon the foliage of the yerba santa or mountain balm (*Eriodictyon californicum*); many of the plants were completely covered with the young and adult females and the egg-sacs. No adult males or their cocoons were collected. *P. yerba-santae* has only been found in the Sespe Canyon, Ventura Co., Cal. Two dipterous insects play a very important rôle in reducing its numbers: the larvae of the Syrphid fly (*Baccha lemur*, O.S.) preys upon the eggs and young, and the small internal parasite (*Leucopis bella*, Loew) upon the half-grown and adult females.

SMITH (P. E.). **A Study of Some Specific Characters of the Genus** *Pseudococcus*.—*Jl. of Entom. & Zool., Claremont, Cal.*, v, no. 2, June 1913, pp. 69-84, 17 figs.

This paper is a continuation of a previous study (Ann. Entom. Soc. Am. iv, no. 3, pp. 309-327) and concerns the adult characters of five species of *Pseudococcus*, namely, *agrifoliae*, Essig, *crawii*, Cog., *obscurus*, Essig, *citri*, Risso, and *longispinus*, Targ.

JACK (R. W.). **Darkling Beetle Grubs Injurious to Tobacco.** [Tenebrionidae.]—*Dep. Agric., Salisbury, Rhodesia*, June 1913, Bull. no. 148, pp. 5, 2 pls.

The author says that the grubs of this beetle are generally referred to by tobacco growers as "wire worms" to which they have sufficient resemblance to justify the mistake. The larvae grow slowly and are difficult to rear in confinement, but one

species was bred through at the Agricultural Laboratory. The grubs are by no means an insignificant pest of tobacco in Rhodesia, and on certain occasions the injury done by them has been very serious. In one district a grower was obliged to abandon the attempt to cultivate tobacco on certain land as the plants were destroyed as soon as they were planted. There is more than one species and some grubs are evidently those of a large beetle, but the adults have not yet been obtained. The grubs eat the stem below the surface of the soil, sometimes completely severing it at 1 inch or 2 inches below the surface. Grubs collected in February made rough earthen cells towards the end of March and in April one which had been disturbed pupated on the surface of the soil. Adults emerged after the 24th April. The species bred out in the laboratory proved to be *Trachynotus griseus*.

The diet of the insects is varied; they will eat living vegetable matter and also dead and dried leaves, but they are strongly attracted by dead insects, even of their own species. They do not eat healthy living insects, even when powerless, but will devour injured pupae and appear to perform the function of scavengers. Although the grubs have been found destructive on sandy granitic soil and the beetles of *T. griseus* are common enough on the red dioritic soil about Salisbury, yet the grubs have never been observed to injure tobacco in the latter area.

There is no doubt that the large species takes at least two years to mature. The grubs are normally inhabitants of the grass veld and only attack tobacco seriously when the grass is ploughed and the land cultivated, depriving them of their only food. The author suggests that rotation of crops with tobacco should be useful, as the beetles are always liable to lay their eggs on fallows; on the better land this rotation is generally practised, and this may account for the fact that injury has not been noted on the red soil. The practise of using the same land for tobacco two years in succession and then allowing it to be overgrown with grass before using it again renders the crop always liable to this form of injury.

PEYRAN (—). **Contre les courtilières.** [Mole Crickets.] *L'Apiculteur*, lxvii, June 1913, pp. 216-217.

The author says that he has been able to save his plants in a very large vegetable garden from various pests by the use of bisulphide of carbon. Instead of using a soil injecting apparatus, which costs 60 francs, he made holes with a stake and by means of a graduated glass poured into each hole 10 cc. of bisulphide of carbon, closing the hole immediately with earth and ramming it down. He made these holes at a distance of 75 centimetres (2 ft. 6 in.) from one another, and in another part of his garden he made them as close as 50 centimetres (20 inches) without harm to his vegetables. Bisulphide not only destroyed numbers of ordinary pests, but was especially useful against mole crickets, which entirely disappeared from the garden.

TIMBERLAKE (P. H.). **Preliminary Report on the Parasites of *Coccus hesperidum* in California.**—*Jl. Econ. Entom., Concord, N.H.*, vi, no. 3, June 1913, pp. 293-303.

Formerly the soft scale, *Coccus hesperidum* was said to have been as destructive and as difficult to control in Californian citrus groves as the black scale, *Saissetia oleae*. At present it is comparatively harmless, probably owing to its inability to withstand the combined effects of fumigation and the recurrent attacks of parasites. Occasional alarming outbreaks, however, occur in fumigation districts, as fumigation is quite as fatal to the parasites as to the host. The worst infestation of the soft scale on record, at Riverside, Cal., took place on a small tract overrun by the Argentine ant, *Iridomyrmex humilis*, Mayr. This and other species of ants eagerly attend the soft scale for the sake of its copious secretion of honeydew, and there is reason to believe that they protect their provider from the attack of parasites, but this conclusion does not seem as yet to have been verified by observation.

The parasites of the soft scale observed in California during the past two years, arranged in order of their probable effectiveness, stand as follows: *Aphycus* sp. near *flavus*, How.; *Microterys flavus*, How.; *Coccophagus lecanii*, Fitch; *Coccophagus lunulatus*, How.; *Aphycus* sp. n. near *coquilletti*, How.

The *Microterys*, and sometimes *Aphycus* also, is attacked by no less than eight hyperparasites: *Coccophagus lecanii*, Fitch; *Pachyneuron* sp.; *Eusemion longipenne*, Ashm.; *Eusemion* sp. n.; *Perissopterus javensis*, How.; *Tomocera californica*, How.; *Cheiloneurus* sp. n.; and *Cerchysius* sp.

*Aphycus* sp. near *flavus* is a common parasite of *Coccus hesperidum* in California, and occasionally attacks small, immature specimens of *Saissetia oleae*. This *Aphycus* is able to pass through many generations in a year, as it develops from egg to adult in about eighteen days at summer temperature. The other new species of *Aphycus* is extremely rare and has been found only at Carpenteria, near Santa Barbara, and at Avalon, Catalina Island.

*Microterys flavus* is found throughout central and southern California, and is most abundant near Santa Barbara and San Diego. It has been reported also from Ontario, several Eastern States and Ceylon. Other recorded hosts in America are *Lecanium corni*, Bouché, and *Pulvinaria vitis*, L.; but in California it seems to attack only the soft scale as a rule. In cases of superparasitism, where there is a struggle for the possession of the host between *Microterys* and some other parasite such as *Aphycus*, the former is generally worsted, probably on account of its specialised larval habits. When the struggle has been between *Microterys* and *Coccophagus lunulatus*, in observed instances the *Microterys* has been starved, as it does not attack the *Coccophagus* larva or pupa, and the latter succumbs because of the premature death of the host. *Coccophagus lecanii* is generally a hyperparasite when it comes into conflict with *Microterys*, but one instance has been observed where it was superparasitic. In

this case the *Microterys* larva was overcome while still small, and *Coccophagus* developed as a primary parasite.

*Coccophagus lecanii* is common almost throughout California and is a frequent parasite of the soft scale, but when associated with *Aphycus* or *Microterys* it is not rarely hyperparasitic.

*Coccophagus lunulatus* is always a primary parasite, and also attacks immature scales of *Lecanium corni* and *Saissetia oleae*. The original record which states that it was reared from *Chrysomphalus aurantii*, Mask., is undoubtedly incorrect, as its peculiar life-history practically precludes the possibility of its parasiting any Diaspine scale. As a parasite of *Coccus hesperidum* it prefers half-grown scales and rarely attacks those that have become mature.

*Cerchysius* sp., although nowhere abundant, is rather frequently found under black scale near Santa Barbara and San Diego. As a parasite of *Microterys flavus* on the soft scale it is extremely rare, and has been found only once at San Diego and once at Santa Barbara.

*Eusemion longipenne* was described by Ashmead as being reared from *Lecanium* on oak in Florida. In California the species has been found at Santa Barbara and Carpenteria, and has been reared in small numbers as a parasite of *Microterys flavus*.

Considering that the soft scale is defenceless it is surprising that only one predaceous insect, *Rhizobius centralis*, has been observed actually to feed on it in Southern California.

Castellano (José C.). **Mosca del durazno.** [The Peach Fly.]—*Gaceta Rural, Buenos Aires*, vi, April 1913, p. 783.

The author says that this fly (*Chyliza persicorum*) does much damage to fruit crops in Argentina. It generally appears at the end of February and during March, finding favourable conditions for its development in windfalls or in stacked fruit, especially those which have suffered slight damage and present cracks and bruises, the insect apparently seeking the fruit juices. The eggs are laid in these cracks and in damp seasons there may be several generations. The author gives the following as useful methods of combating the insects:—(1) to plant the trees in such a way that they shall have plenty of air and light, and that the branches of neighbouring trees shall not cross or touch one another; (2) to cut the trees in the form of a vase leaving only three or four main branches; in this way the fruit will dry more quickly and will not present such favourable conditions for oviposition by the insects; (3) never to make heaps of fruit under the trees; (4) to collect all windfalls and keep the soil under the trees thoroughly clean and free from weeds; (5) if the fruit, after gathering, must remain for several days in store near the orchard, it should be kept in a dark and thoroughly dry place, as the insects have an objection to darkness; (6) hanging pots in the trees full of honey poisoned with 1 per cent. of arsenic has been found useful, and Cellis' formula for spraying is also recommended:—Molasses 65 parts, honey 31 parts, glycerine 2 parts,

arsenate of soda 2 parts, thoroughly mixed and made up with water to a 10 per cent. solution; from 300 to 400 grms. (¾ to 1 pint) are said to suffice for one tree. If after this spraying treatment no rain has fallen, the fruit should be thoroughly washed or peeled before being eaten.

JONES (C. R.). **The Coconut Leaf-miner Beetle (*Promecotheca cumingii*, Baly).**—*Philippine Agric. Review*, vi, May 1913, pp. 228-233, 1 pl., 1 fig.

Although the coconut palm is attacked by a comparatively small number of insects the damage done in the Philippines is large compared with insect injury to some other crops. The present pest has already been recorded by the author [*cf.* this Review, A., p. 118], and he now gives a few additional notes on it. The period of incubation varies from 13-15 days, while the larval stage averages about 32 days, of which 28 are spent in feeding. A characteristic habit of the larva is the depositing of its excrement in two rows, one on either side of the excavated chamber. If this chamber be opened the leaf curls and dies, and the larva either dies or its development is greatly retarded. The pupal stage varies from 5-12 days. The beetles are sluggish and do not fly readily when disturbed; they crawl about on the leaves of the young coconut and feed extensively upon the tissues between the veins of the leaflets.

Two species of Hymenoptera of the family CHALCIDIDAE have been bred in great numbers, one from the egg and one from the larva and pupa; these have not yet been identified. The protection afforded by the leaf to the eggs, larvae and pupae prevents the use of any fumigant other than hydrocyanic gas, which could only be used in cases where infestation was very serious. The destruction of infested leaflets and hand-picking of the adults from the leaves is suggested as the simplest remedy.

PINET (E.). **Les Insecticides en Viticulture; notamment contre la Cochylis, L'Eudémis, L'Altise et le Cigarier.** [Insecticides in Viticulture; especially against *Clysia ambiguella*, *Polychrosis botrana*, *Haltica*, and the Cigarette Beetle.]—*Bull. Soc. Agric. France*, 15th May 1913, pp. 357-363.

This paper is a general resumé of the various means now in use for protecting vines from insect attack. The author points out the advantage of using sprays at a relatively high temperature, and says that a temperature of 40°C. at a few inches from the end of the jet does no harm to the vine, while it increases the effect upon the insect. He describes an experiment with an apparatus constructed for the purpose and consisting of a boiler mounted on wheels, in which water containing a certain proportion of a secret composition was vaporised and the spray conducted by a rubber hose amongst the vines. All larvae that were directly touched by the spray were killed.

He cites the details of experiments made in Anjou in 1909 against the Cigarette Beetle and quotes the figures of the results obtained by treatment with a mixture containing copper and arsenate of lead. Had nicotin been used, the expense for material would have been much greater, and it would have been necessary to spray at least twice as often; he thinks that in this case the action of the poison was rather that of an insectifuge than an insecticide. He then goes on to consider *Haltica* and remarks with Dr. Trabut that Bordeaux mixture is an insectifuge for *Haltica*, but that more sprayings are necessary because *Haltica* may produce from four to six generations in the year. It is more or less obvious that the internal poisons will only be of real avail against the larvae, and even then care must be taken to apply them at the correct time; their efficacy will largely depend upon the uniformity of the spraying, and hence the great importance of using sprays of good wetting power.

Internal arsenical and nicotin poisons employed against *Clysia* (*Cochylis*) and *Polychrosis* (*Eudemis*) may act on the perfect insect, the larvae or the eggs. Against the perfect insect they are insectifuges, and their chief effect is to reduce oviposition, this being especially marked when nicotin is used; whereas against the Cigarette Beetle and *Haltica* arsenate of lead is much superior. Bordeaux mixture is said to kill the egg, but nicotin has unquestionably a very definite abortive action. Nicotin employed against the larvae of *Clysia* and *Polychrosis* acts sometimes as a contact and sometimes as a stomach poison; arsenate of lead acts only as a stomach poison and has the advantage of enduring longer than nicotin. The period during which the larva is capable of but feeble resistance is never very long, so that unless the exact moment is taken for spraying, the labour may be in vain. One or two sprays with nicotin, in the author's experiments, destroyed 70 to 80 per cent., and the larvae which survived developed normally and committed the usual amount of destruction; whereas a very similar, but more uniform, result was obtained with arsenate of lead and the larvae which escaped the poison never developed properly.

Cubero (M.). **La desinfección de las plantas por medio del ácido cianhidrico en los establecimientos de Horticultura.** [The disinfection of plants by means of hydrocyanic acid in horticultural establishments.]—*La Ciencia Agricola, Barcelona*, iii, 30th June 1913, pp. 4-5, 2 figs.

The author says that in Valencia, Andalusia and Murcia this method of disinfecting plants has been carried out on a considerable scale by the assistance of the Government and with the most excellent results. He describes the methods adopted for disinfecting orange trees and destroying "pollroig" (*Aspidiotus dictyospermi*) and other pests which he thinks have been very largely introduced from outside. The chamber used was made of brick, lined with Portland cement, 2 metres (6′ 8″) wide, 4½ metres (15′) long and 1½ metres (5′) high with a capacity of something over 22 cubic metres (495 cubic feet).

The plants are first watered and are then introduced into the chamber. The door is closed and also the chimney, and a receptacle is arranged within the chamber in which 140 grms. (5 oz.) of pure sodium cyanide is placed and 240 grms. (8½ oz.) of distilled water to which 160 grms. (5⅔ oz.) of commercial sulphuric acid (66° Baumé) is introduced from the outside by means of a funnel. The operation is allowed to continue for half-an-hour; the shutter in the chimney is then opened and afterwards a small trap in the main door of the chamber, so that a draught is established. In an hour the main door can be opened and the whole place thoroughly aired. A microscopic examination showed that all the Coccids which entered the chamber had been killed.

MENDES (Candido). **Lepidopteros mais damninhos á Agricultura nos arredores de S. Fiel.** [The principal Lepidoptera injurious to Agriculture in the neighbourhood of S. Fiel, Beira Baixa, Portugal.]—*Broteria, Salamanca*, Ser. Zool., xi, 1913, pp. 40-44.

The author gives the following list of Lepidoptera whose larvae damage plants in the neighbourhood of S. Fiel.

*Pieris brassicae*, L., damages cabbages. *Vanessa polychloros*, L., damages cherry trees. Both the larva and pupa of this insect would appear to have many enemies. *Acherontia atropos*, L., occasionally found on olive trees and amongst potatoes; never sufficiently abundant to cause very serious damage. *Phalera bucephala*, L., eats the leaves of whole branches of chestnuts, cork trees and holm-oaks. The attack generally occurs twice in the year. *Thaumetopoea pityocampa*, Schiff., damages pine trees and in September and March is a great pest of *Pinus maritima*. In spite of this attack a great number of the pine trees resist and come into leaf again in the spring. *Lymantria dispar*, L., attacks cork trees and chestnuts. *Acronycta psi*, L., attacks young chestnuts. *Mamestra brassicae*, L.; the larva attacks cabbages at night and especially seedlings just before they are ready for planting out. *Sesamia nonagrioides*, Esp., burrows into the stalks of millet and occasionally into maize. *Zeuzera pyrina*, L., bores the trunks and branches of apples, pears and other fruit trees. *Galleria melonella*, L., the Bee Moth. *Plodia interpunctella*, Hb., damages wheat in the granary and dried figs. *Ephestia calidella*, Gn., damages dried figs. *Pyrausta nubilalis*, Hb., bores the stems of millet. *Cacoecia xylosteana*, L. and *Tortrix viridana*, L.; the larvae of both species roll and eat the leaves of oak. The author thinks that in spite of the great abundance of these caterpillars the actual damage done is not very great. *Polychrosis botrana*, Schiff.; in the neighbourhood of S. Fiel the perfect insect is not common and the vineyard owners do not attribute any special loss to the work of the larva. *Carpocapsa pomonella*, L.; the first generation in June causes the fruit to fall before it is ripe; the second in August and September attacks the fruit and causes it to rot; pears are also greatly damaged by it, and it occasionally attacks

damsons, peaches, plums and oranges. *Carpocapsa splendana*, Hb., attacks the acorns of both the cork and holm-oak. *Carpocapsa splendana*, Hb. var. *reaumurana*, Hb., attacks chestnuts, but more frequently the wild "reboleira" than the "longal" or grafted chestnuts. *Simaethis remorana*, Hb., lives in webs in the leaves of the fig tree. *Prays oleellus*, F.; the larva attacks olive trees; there are three generations, the first of which lives on the leaves, the second on the flowers and the third on the fruit. *Phthorimaea solanella*, Rag., attacks potatoes.

Jones (C. R.). **Insect Notes from the Philippines.**—*Philippine Agric. Review*, vi, May 1913, pp. 246-250.

During February last "Caballero" trees (*Delonix regia*) in various parts of the city of Manila were severely attacked by several species of bag-worms; some of the defoliated trees contained hundreds of these suspended insects at a time, each in a protective case of leaves.

It has been noticed that a species of Red Ant (*Solenopsis geminata*) is very injurious to okra (*Hibiscus esculentus*), attacking the young fruit-buds just before and after blooming or completely destroying the calix and corolla; in some cases considerable damage was done to the seed-pods. The seeking out of the nests and drenching them with petroleum is suggested as an effective remedy.

*Prodenia litura*, F., has been found damaging tobacco and is at all times a serious pest, but easily controlled by a light application of Paris green or arsenate of lead. Another effective means of controlling this insect is hand-picking shortly after the larvae have hatched. The eggs are laid in clusters of from 300-500 each and the larvae remain close together for 3-5 days.

As an example of natural insect control the author cites the case of a Pierid which completely defoliated the trees of *Cassia siamea*, Lam. The eggs which were deposited very freely on these trees were taken to be bred out in the laboratory and preparations were made to spray the trees as soon as the eggs hatched. The collected eggs hatched, but those left on the trees did not and on examination were found to be parasitised by a small Hymenopteron.

The coconut weevil (*Rhynchophorus ferrugineus*, Oliv.) in certain districts has done so much damage as to attract attention. At Ambalang, Oriental Negros, the planters are extracting these weevils from the coconut and burí palms and it is reported that one man has killed as many as eight hundred of these insects in a single day; between the middle of January and 4th February over 52,000 of them were destroyed by the coconut growers in this section, the greater number being taken from burí palms. There are four localities in the Philippines where this insect causes considerable damage, namely: Oriental Negros, Zamboanga, Laguna and Tayabas. The following insects have been taken from the seed-heads of lettuce at Singalong:—

Pentatomidae: *Nezara viridula*, L., *Eurydema pulchrum*, Westw.; Pyrrhocoridae: *Dysdercus cingulatus*, F., *D. poecilus*, H.S.; Chrysomelidae: *Aulacophora coffeae*, Hornst.

LELLI (A.). **Il Tingide del Pero.** [The Pear Tingid.]—*Rivista di Agricoltura, Parma*, xix, 27th June 1913, pp. 403-404.

The author says that this insect does a large amount of damage to pears, especially to those cultivated "en espalier" and in warm positions. Both nymphs and adults puncture the underside of the leaf, often in enormous numbers, producing small galls and causing the leaves to fall. The best remedy, but one which can only be applied to valuable trees, is fumigation with tobacco. Some growers have found that painting the trunks of the tree in autumn with milk of lime, or with milk of lime mixed with sulphate of copper, or with a thick mixture of milk of lime and wood ashes, well rubbed into the bark, gives good results. The author recommends tobacco spray, 1 to 1·2 per cent. with soapy water, as a real remedy. The spray should be in the form of a fan and should be directed from below upwards, great care being taken to wet the underside of the leaves thoroughly. He also recommends that the insects should be carefully collected on a cloth spread on the ground under the trees. Spraying with pyrethrum is also effective, but much too costly. He warns growers that one spraying is rarely sufficient.

BALLAND (A.). **Les essais d'acclimatation de la cochenille en France.** [The attempts to acclimatise the cochineal insect in France.]—*Rev. Scientifique, Paris*, li, no. 26, 28th June 1913, pp. 801-804.

An interesting account of the history of cochineal culture from the importation of the insect into Europe from Mexico by the Spaniards in 1523, until the decay of the industry in France and Algeria upon the advent of chemical dyes.

SICARD (H.). **Un nuevo parásito del "pyralis pilleriana."** [A new parasite of *Sparganothis pilleriana*.]—*Revista del Instituto Agríc. Catalán de San Isidro*, lxii, 5th June 1913, p. 175.

This parasite (*Parerynnia vibrissata*, Rond.) is reported to have destroyed, in the current year, in the neighbourhood of Montpellier, 60 per cent. of the pupae of this Pyralid. The whole larval and pupal stage is passed within the body of the host. The perfect insect begins to appear early in July and no more are seen at the end of the month. Sicard has not yet been able to observe accurately the manner of oviposition, nor is he able to explain how it is that the young larvae may still be found in the body of the host 11 months afterwards. The action of the parasite is somewhat restricted by a *Pteromalus* and by *Chalcis diminuta*, L., which is also regarded as a parasite of the Pyralid.

LE MOUT (—). **Destrucción de insectos.** [Destruction of insect pests].—*Rivista del Instituto Agricola Catálan de San Isidro*, lxii, 20th June 1913, p. 191.

The author has for some time been experimenting on the destruction of insect pests by means of vegetable parasites,

making use of artificial cultures of *Sporotrichum globuliferum* against *Pentatoma ornatum*, and with success. He has further continued his experiments against other Rhynchota attacking vines and fruit trees, such as the woolly aphis and *Phylloxera*, by burying prepared cultivations of *Sporotrichum globuliferum* and of *Botrytis bassiana* at the foot of the attacked trees; he found that in the following spring they were free from these pests, whilst the controls were still covered with them. Experiments with *Isaria densa* in the same direction have given good results, and he has been able to discover in the bodies of the pests which were probably killed in July 1912, material for fresh cultures, proving that the fungus had caused their death. The author is now experimenting against *Phylloxera* by the same method.

TOWNSEND (C. H. T.). **Preliminary Report on the Picudo of Cotton in Peru.**—*Jl. Economic Entomology*, vi, no. 3, June 1913, pp. 303-312.

The Peruvian cotton-square weevil, *Anthonomus vestitus*, Boh., now commonly known in Peru as the 'picudo del hielo,' is a native of South America. It was found by the author in September 1910 at Cumbibira in the Piura valley, where it is a cotton pest, breeding and feeding in the buds of the squares. The same year it was found infesting cotton throughout the Piura and Chira valleys. In 1911 it was recorded from the Guayaquil district (Ecuador), and also far to the south, in the Chancay valley. During 1912 it was found abundantly in the Casma valley, in some numbers at Lima, a few specimens in the Rimac valley at about 3,000 feet, and in numbers at Tambo de Mora. The remarkably complex character of the more or less arid coast to foothill climate of Peru, which exhibits numerous gradations of aridity and humidity, makes a knowledge of humidity and temperature ranges of the weevil and its enemies very important, and a comparative study of the weevils will indicate those districts where cotton may be cultivated with little injury.

In Piura the following parasites have been found infesting the the 'picudo':—*Triaspis vestiticida*, *Microbracon vestiticida*, *Cerambycobius townsendi*, *C. peruvianus*, *Catolaccus townsendi*, *Eurytoma piurae*.

The small black ant, *Solenopsis geminata*, which in Texas is known as a very effective enemy of the boll-weevil, exists in the western foothills of the Andes, and it is almost certain that it would destroy the early stages of the picudo as effectively as it does those of the boll-weevils, and therefore the ant should be established in the cotton districts of the Peruvian coast region. A closely allied species, *S. pylades*, known in Peru as 'hormiga picador,' is common in the Piura cotton fields, but it has not as yet been observed to prey on the weevil. The ant, *Ectatomma tuberculatum*, which in Guatemala attacks the adult boll-weevils feeding and ovipositing in the green squares, also occurs in the

eastern foothills of the Andes from Guatemala south through Costa Rica and the Andean Montanya to the valley of the Rio Beni in Bolivia.

Carefully planned series of experiments are needed to demonstrate the details of cultural control measures against the picudo to be adapted to the varying conditions existing in the cotton districts of the coast region. As this cotton pest causes an annual loss to Peru of about £400,000, and as moreover the weevil is capable of keeping alive without light or food for more than a month, the necessity for control measures, carried out in a systematic and thorough way, is self-evident.

Portchinsky (I. A.). **ЛИСТОѢДКА-ОБМАНЩИЦА И ЗНАЧЕНІЕ ЕЯ ПРИ ИСКУССТВЕННОМЪ РАЗМНОЖЕНІИ ЯЙЦЕѢДА ПЛОДОЖОРКИ ВЪ ТЕЧЕНІЕ ЗИМНЯГО ВРЕМЕНИ** [*Phalera bucephala*, L., and its importance for the artificial breeding of *Pentarthron (Oophthora) semblidis* in winter].—**ТРУДЫ БЮРО ПО ЭНТОМОЛОГІИ** Ученаго Комитета Главнаго Управленія Землеустройства и Земледѣлія [Memoirs of the Bureau of Entomology of the Scientific Committee of the Central Board of Land Administration and Agriculture], x, no. 4, 16 pp., 8 figs. St. Petersburg, 1913.

V. P. Pospelow in his paper "An experiment on the artificial infection of *Agrotis segetum* by its parasites" in the "Journal of the Sugar Industry" (*Vestnik Sacharnoi Promischlennosti*, 1913) describes a method of breeding the Chalcid parasite *Pentarthron (Oophthora) semblidis* during the winter. As it does not breed naturally at this season, it is necessary to maintain a constant supply of eggs of suitable insects for this purpose. Pospelow succeeded in obtaining winter imagos of *Euxoa (Agrotis) segetum* which he fed on sugar syrup, and these started ovipositing on 8th January 1913 and continued to 23rd January. The caterpillars were fed by him on young sprouts of wheat, and from the fourth stage of their life on thin slices of potato. Pospelow concludes that by placing the hibernating caterpillars of *E. segetum* under warm conditions, it is possible to obtain a constant supply of the eggs of this insect for breeding the *Pentarthron*, which develops very quickly.

Dr. Portchinsky suggests that the process may be shortened by using, in place of the caterpillars, the pupae of insects wintering in the pupal stage, a suitable insect for this purpose being *Phalera bucephala*, L., or another species of the same genus *Phalera bucephaloides*, O. It has already been shown by the experiments of I. V. Vassiljew that the eggs of the former insect are freely attacked by the above parasite. This moth is widely distributed in Russia, multiplying in such large numbers that in some parts it is regarded as a forest pest. The pupae are very hardy and the author does not remember a case of failure to obtain perfect insects from these pupae, without any specially

careful treatment; the caterpillars are also equally hardy. For conducting these experiments in Russia the author recommends that in the first instance the pupae should be imported from abroad; in Germany they are offered during the autumn and winter at 1 mark per dozen, and afterwards, should the experiments prove satisfactory, a regular supply could be organised from the Russian forests through the forest officials. In the Government of St. Petersburg this moth is common, the larvae feeding on oak, birch, willow, lime, etc.

THEOBALD (F. V.). **Report on Economic Zoology, for the Year ending 30th September 1912.**—*South-Eastern Agricultural College, Wye*, 110 pp., 36 figs. Price 2*s*. 6*d*.

This report contains an account of the numerous enquiries with reference to noxious insects which were received at Wye during the year specified, together with the recommendations for dealing with them which were sent out in reply. It therefore furnishes a very useful summary of British pests. Various original papers on injurious insects by Mr. Theobald are also reproduced, several of which have already been noticed in this Review (Series A, pp. 33, 77, 91 and 236).

BODKIN (G. E.). **The Rice Caterpillar,** *Laphygma frugiperda*, **S. & A.; a Rice Pest in British Guiana.**—*Jl. Board of Agric., Br. Guiana, Demerara*, vi, no. 4, April 1913, pp. 172-183.

The name "fall army worm" used for *Laphygma frugiperda* in U.S.A., is hardly applicable to the insect in a continuous tropical climate like that of British Guiana, and it has been decided to call it the rice caterpillar, especially as its attacks in that country are confined to rice or grasses. The infestation by this pest was abnormally severe during 1912, both in British Guiana and in the United States. The rice caterpillar generally occurs in countless numbers at the most critical stage of growth in the young rice plants. The young larvae feed on the epidermal tissues of the leaves, producing yellow patches which eventually turn grey and wither. Later, they consume the whole leaf, or they bite through the leaf at its base causing it to fall off. A useful résumé of the life-history is followed by a discussion of parasitic and other methods of control. In British Guiana the best and simplest method of dealing with the pest is to construct the nursery beds so as to allow of complete flooding at any time to the height of the young plants. By this means the larvae are floated on the surface of the water and may there easily be collected and destroyed. Hand-picking the caterpillars, though tedious, is effective and is easily performed by children. Small perches for birds may be erected about the

nursery, and have in a number of cases proved to be of the greatest benefit. If the pest has been allowed to pupate, the dams about the rice nursery should be beaten and well plastered down with mud, so as to prevent the emergence of the moths from the pupae, which are to be found in the soil in this position.

BODKIN (G. E.). **The Egg Parasite of the Small Sugar-Cane Borer.** —*Jl. Board of Agric., Br. Guiana, Demerara*, vi, no. 4, April 1913, pp. 188-198, 4 diagrams.

Of the several parasites known to attack the small sugar-cane borer (*Diatraea saccharalis*) and allied species in British Guiana, by far the most effective is a species of *Trichogramma* closely allied to, or identical with, *T. pretiosa*, Riley. Its first appearance in the Colony is not recorded, though the borer is known to have been present in the cane-fields for the last thirty years. At present the Chalcid is distributed everywhere where its host is to be found, *i.e.*, over all the cane-growing areas. Parasitised eggs of *Diatraea* have been observed on razor grass and on rice, which plants the borer also attacks. The characteristic blackened appearance of parasitised egg-masses renders them conspicuous in comparison with unparasitised ones, and owing to this fact the percentage of parasitism is apt to be overestimated.

Experiments on the life-history and habits of the parasite were made by the author, assisted by Mr. L. D. Cleare, jr., in the biological laboratory of the Department of Science and Agriculture. Parasitised egg-masses were collected in the field, brought into the laboratory and placed in small glass tubes the ends of which were then plugged with cotton wool. The emergence, copulation, etc. of the parasites could thus readily be observed. The maximum number of parasites capable of developing in one *Diatraea* egg is five; the normal appears to be three. Some of the *Trichogramma* oviposit more systematically and effectively than others, a fact which is illustrated in the diagrams accompanying the paper. The average proportion of females to males appears to be 10 to 1. In the laboratory copulation takes place immediately after emergence and the females seldom, if ever, escape fertilisation; the author is further able to confirm the observations made in the U.S.A. that the female *Trichogramma* is capable of producing a parthenogenetic generation, the progeny invariably being male. Shortly after emergence and fertilisation the female begins to oviposit, parasitism of the eggs being only successful within seven days after their deposition by the female cane-borer. The maximum observed number of parasites produced by a single female is 80 survivors of 100 ovipositions. Under laboratory conditions *Trichogramma* (fed with syrup) has been kept alive for five days, the usual length of life being from two to three days. The author deprecates the burning of the trash in canefields as resulting in the destruction of these beneficial insects. The collection of *Diatraea* eggs by children and the rearing of parasites in the laboratory is described. No hyperparasites have as yet been met with.

STEFANI PEREZ (T. de). **L'*Icerya purchasi*, Mask., negli agrumeti di Bagheria.** [*Icerya purchasi* in the citrus groves of Bagheria.]—*Boll. del R. Orto Botanico e Giardino Coloniale di Palermo*, Jan.-Sept. 1912, xi, nos. 1, 2, 3, 1913, pp. 81-82.

*Icerya purchasi* was introduced into Sicily, probably from Naples and Messina, and seems to be gaining fresh ground daily. In the Bagheria district this pest has been responsible for the dying off of several mandarin trees and many young lime trees have been also attacked. The problem is becoming so serious that the Sicilian fruit-growers are advised to introduce *Novius cardinalis* to check the pest.

FRENCH (C.). **Report on Furniture Beetle as Affecting Tasmanian Timber.** Presented to both Houses of the Tasmanian Parliament, 20th May 1913.

At the request of the Tasmanian Government the author (Victorian Government Entomologist) visited Tasmania in April 1913 for the purpose of investigating the statements made that Tasmanian hardwood and other timbers are attacked by the furniture or powder post borers (*Lyctus brunneus*). An inspection of different timber-yards, many public and private buildings constructed of Tasmanian hardwood, saw-mills and forests, revealed the fact that the borer trouble existed only in two or three timber-yards, and there only to a small degree. The trouble was caused by one or two careless timber merchants sending infested timber to Melbourne, otherwise Tasmanian timber can be recommended with the utmost confidence.

All saw-millers should be compelled to cut the timber on the quarter, as this would do away with the sap-wood and prevent the attacks of borers to a large extent, as they rarely attack the solid wood. In the interests of the Tasmanian timber industry the borer (*Lyctus brunneus*) should be proclaimed under the Tasmanian 'Vegetation Diseases Act, 1898.' Persons found shipping or having borer-infested timber in their possession should be compelled to destroy it. The appointment of an inspector is also recommended.

KERSHAW (J. C.). **Froghoppers.**—*Dept. Agric., Trinidad*, Special Circular no. 7, 20th June 1913.

The author has failed to breed the vermilion Trichogrammid egg-parasite of the froghopper in breeding-cages during the dry season, so that it became necessary to fall back on artificial means of controlling the pest. Apart from the green muscardine fungus, there are three methods which promise success and are being tried on a large scale at Chaguanas:—(1) The application of Nitrolim to the roots of the canes by means of the usual dusters; (2) kerosene-lysol emulsion (3 oz. lysol, 9 oz. kerosene, 4 gals. soft water) applied, when the canes are small, against the adult froghopper, from a whisky bottle fitted with a cork through which passes a short piece of glass tube (¼ inch bore) so that it emits a jet, not a spray; (3) the instant removal of the trash to cattle-sheds should froghopper eggs be found on the old leaves of growing canes.

KEILIN (D.) & PICADO (C.). **Evolution et formes larvaires du** *Diachasma crawfordi*, **sp. n., Braconide parasite d'une mouche des fruits.** [Development and larval forms of *Diachasma crawfordi*, sp. n., a Braconid parasite of a fruit fly.]—*Bull. Sci. de la France et de la Belgique*, (7) xlvii. no. 2, 24th June 1913, pp. 203-214, 1 pl.

In the course of their investigations on *Anastrepha striata*, Schiner, which attacks Central American fruits, especially guava (*Psidium*) in Costa Rica, the authors discovered that this fruit fly was parasitised by a hitherto undescribed Braconid, *Diachasma crawfordi*. It is probable that the latter species is allied to the *Diachasma* found by Crawford to parasitise the Mexican orange Maggot, *Anastrepha (Trypeta) ludens*, Loew. Prof. Bezzi informed the authors that he had received pupae of *Anastrepha fraterculus* from Brazil which were parasitised by *Biosteres brasiliensis*, Sz., and *B. areolatus*, Sz. The possession by *D. crawfordi* of a long ovipositor indicates that this Braconid parasitises the larvae of the fruit fly when they are partly hidden in the fruit. It is supposed that the parasite deposits its eggs when the fruit (*Psidium*) has fallen to the ground, and is split or cracked, so as partially to expose the host maggots. The pericarp of *Psidium* is too thick for the parasite to pierce with its ovipositor.

ZACHER (Dr. F.). *Icerya purchasi*, **Mask., eine Gefahr für die Südfruchtkulturen in Deutsch-Südwestafrika.** [*Icerya purchasi*, a danger to the cultivation of southern fruits in German S.W. Africa.]—*Der Tropenpflanzer*, xvii, no. 6, June 1913, pp. 305-315, 3 figs.

The author regrets the neglect of economic entomology in German S.W. Africa in contrast with the provision of a State institute for applied zoology in Amani (German E. Africa), particularly because within a few years the former colony promises to become a fruit-growing country, which also means that insect pests will have to be contended with. The Imperial Biological Institute for Agriculture and Forestry in Berlin recently received from Warmbad (S.W. Africa) a citrus twig infested with the scale, *Icerya purchasi*. The bulk of the paper is a résumé of the well-known methods of control employed in America and elsewhere, and the author advocates the introduction of *Novius cardinalis*.

FELT (E. P.). **Gouty Pine Midge.** *Itonida inopsis*, **O.S.**—*Jl. Econ. Entom.*, Concord, N.H., vi, no. 3, June 1913, p. 331.

Last year's observations (Jl. Econ. Entom. v, p. 368) and those of the present season show that under certain conditions this species may be of some economic importance, even though its host plant, the scrub pine, *Pinus rigida*, is not one of the most valuable trees. The larvae of this midge were very abundant

at the end of May 1912, midway between Albany and Schenectady, N.Y., and similar conditions prevailed this season at the end of April. The infestation produces an approximate doubling in the diameter of the twig and presumably interferes with the movement of the sap. One small scrub pine had nearly every shoot affected and over 1,000 larvae or cocoons were to be found on this tree, the vitality of which was much reduced, as shown by the short, pale needles. The injury by the preceding brood showed as swollen, scarred, pitchy areas.

HASEMAN (L.). **Unspotted Tentiform Leaf-Miner of the Apple (*Ornix geminatella*, Pack.).**—*Jl. Econ. Entom.*, vi, no. 3, June 1913, pp. 313-316.

For the last three or four years this insect has been gradually increasing in numbers in Missouri, and probably reached a climax during the summer of 1912. In September and October it was almost impossible to find a single full-grown apple leaf which did not have from one to twenty mines. The pest invariably (Missouri) passes the winter in the pupal stage, protected by a rather firm cocoon, which is made somewhere along the edge of a leaf in late autumn. After the first heavy frosts the leaves containing the cocoons and pupae fall to the ground where they remain throughout the winter. In case the leaf-miner requires special attention it can be checked by early spring ploughing, which will destroy the leaves containing the wintering pupae. Spraying has not had the least effect upon the development of the insect, owing to the fact that the caterpillar is never exposed to the poison upon the foliage, except in those cases where it may feed to a slight extent after leaving the old mine. During the summer and autumn various hymenopterous parasites were so numerous that only a very small percentage of each brood of miners (five distinct, but overlapping broods were observed during the past summer) succeeded in maturing. *Ornix geminatella* will probably never prove to be an exceedingly important orchard pest, and there is little evidence of its having injured either the trees or the apple crop in Missouri.

TOWNSEND (C. H. T.). **A Brief Report on the Piojo Blanco of Cotton.**—*Jl. Econ. Entom.*, vi, no. 3, June 1913, pp. 318-327.

The 'piojo blanco' (*Hemichionaspis minor*) has, since 1905, developed into a serious pest of cotton in the Department of Piura, Peru. It evidently entered this district at the port of Paita on shipments of plants from Guayaquil or Tumbes, and was carried by rail to the towns of Sullana and Piura. The scale has been spread in the Chira and Piura valleys by two agencies operating in contrary directions. The south winds have carried it northwards in both valleys, and the waters of the two rivers have carried in generally southwards.

The following parasites and predaceous enemies are now check-ing the pest in the Piura Department. *Aspidiotiphagus citrinus* deposits in the active young of the scale; *Prospaltella peruviana* is less evenly distributed than the first parasite; *P. aurantii* is rare (Lima and Piura) and uncommon, probably imported from N. America; *Aphelinus fuscipennis* occurs in the Piura valley only; *A. quaylei* as yet recovered in Piura only from *Pseudaonidia* sp., but certainly at work on the piojo blanco; *Signiphora* sp. is common; *S. occidentalis* not found in Piura till after the 1910 liberations from Lima and 1911 from Barbados; *Neosignphora nigra* is only found in the Piura valley, and not in Lima; *Arrhenophagus* sp. probably *chionaspidis*, not found till after Japanese and Barbados liberations of 1911. A very small black Coccinellid, *Microweisia*, or an allied genus, is very abundant. Two pale yellow Coccinellids, *Psyllobora* sp. and *Scymnus* sp., are locally numerous in the Piura and Chira valleys; also the mite *Hemisarcoptes malus*, species of *Gamasidae* and *Sporotrichum* sp., probably *minimum*. In calculating the spread of these enemies a wide allowance must always be made for fluctuations due to factors beyond control such as variations in climatic conditions and in the activity of the host plant due to irregularity of water-supply. Of the 15 enemies enumerated as now at work on the piojo blanco in Piura, probably the most effective at present is the *Microweisia*, next in effectiveness being *Aspidiotiphagus* and *Arrhenophagus*. The importation, liberation and distribution of the predaceous enemies and parasites is discussed at some length, as well as the artificial breeding of Coccinellids in the insectary. If the breeding of native Coccinellids does not give the desired result, the Japanese *Chilocorus similis* and Florida coccidivorous fungi should be tried in the cotton fields during the wet season, carrying them both artificially through the ensuing dry season in the insectary and putting them out again in the field at the beginning of the following wet season. If the Japanese species cannot be treated in this way, Coccinellids must certainly exist in Lower California and Western Australia that can be so handled.

Three important cultural measures are indicated as a result of the investigations so far made at Piura. (1) All infested plants other than cotton, such as castor bean, pigeon pea, beans, melon, willow, weeds, etc., should be cut out and burned during November and December. (2) Especially during the dry season, plenty of water, as much as the cotton plants can stand without interfering with the proper ripening of the bolls and the crop, should be applied; this stimulates the growth of the cotton plant so that it becomes more resistant to the attack of the scale, and at the same time supplies the degree of atmospheric humidity in the fields necessary to maintain the parasites and enemies in active and effective condition. (3) According to the variety of cotton adapted to the conditions of a particular district, the cotton plants should be cut back and burned after the gathering of the crop, once a year, every two years or, in the case of the native tree cotton (or pais variety), not oftener than once in three

years. Field station experiments are necessary to determine the most advantageous operative details.

The author calculates that the piojo blanco, if left to itself, will diminish the value of the Piura crop by at least 40 per cent. Its normal possibilities for annual damage in Piura are approximately £200,000. The Peruvian Government is urged to institute a rigid quarantine service at all the ports south of Sechura, against all the ports from Sechura to Panama, both inclusive, so far as plant importations are concerned, because the piojo blanco exists in practically the whole west coast region and infests a very great variety of plants.

CARDIN (P.). **A Probable Parasite of *Scapteriscus didactylus* in Cuba.** *Jl. Econ. Entom.*, vi, no. 3, June 1913, pp. 330-331.

The author discovered that the mole-cricket, *Scapteriscus didactylus*, Latr., known under the name of 'la changa' in Porto Rico as a pest of tobacco, also occurs in the tobacco section of Pinar del Rio Province, Cuba, where it is called 'berraquito de la tierra.' That *S. didactylus* has not become a serious pest in Cuba is due to the common red ant *Pheidole megalocephala*, F., and the fire ant *Solenopsis geminata*, F. At the bottom of one of the burrows of *Scapteriscus* were found the cocoons and a full-grown larva of a parasite, probably a *Myzinida*.

VOSLER (E. J.). **A New Fruit and Truck Crop Pest (*Irbisia brachycerus*, Uhler).** *Monthly Bulletin, State Com. of Hort., Sacramento, California*, ii, June 1913, pp. 551-556.

This Capsid is reported as doing serious damage to peaches in Solano Co., California, by puncturing the fruit. It is also recorded from another locality as doing great injury to garden crops. The author found that the insect was not only common on garden crops but on weeds in uncultivated areas several miles from the gardens affected, even wild cucumber suffering. Radishes and rhubarb were particularly affected, though lettuce and onions were also attacked. Hundreds of the insects could be found on the underside of the leaves of rhubarb, and the radishes were almost entirely killed. Roses in the neighbouring garden have been greatly damaged by having the tips of the petals blackened and dried. No eggs or larvae could be found and the author was of opinion that the insects had either migrated from natural food-plants which had dried up, or that it was too early in the season for egg-production to take place. Two weeks later the infested gardens were revisited and the crops were found to be entirely free from the pest. In these circumstances it is a little difficult to suggest a remedy. The insect is found all over California, Colorado, Washington, Idaho, New Mexico and in the Wasatch Mountains of Utah. O. Heidemann has redescribed the insect as *Capsus solani*.

In the same bulletin R. S. Vaile reports on *Pseudococcus bakeri*, Essig, the walnut mealy bug, so called from its habit of feeding

walnut trees in Ventura County. He has now discovered that will also live on apples, pears, oranges, lemons, pomelo, elder, cottonwood, southern California black walnut, nightshade and a few ornamental shrubs. In one or two localities it has been found infesting citrus. For a portion of the year it lives primarily on native elder and nightshade, and solanum bushes growing under orange trees have been found with the roots thickly covered with all stages, from eggs to mature adults. The life-history is very similar to that of *Pseudococcus citri*, but the egg-masses are much looser and the number laid by each female is much less. The author thinks that this scale can hardly be regarded as a serious pest and that it will be effectually kept in check by sprays in use against other insects.

A. J. Cook reports that the Corn Worm (*Chloridea obsoleta*, F.) is a serious pest in all parts of California. From the point of view of the tomato-grower its partiality for sweet corn provides a remedy. He suggests that every tenth row in a tomato field should be planted with corn. The insects are attracted to the latter and the tomatos escape. The corn can then be sprayed and the insects killed.

J. D. Neüls reports on testing the use of commercial lime-sulphur with and without the addition of flour paste against the citrus red spider (*Tetranychus mytilaspidis*), and he says that the spotting of the leaves and fruit, familiar to those who use lime-sulphur, was not to be found on those trees where flour paste had been added. Pumps and spraying machines worked much more easily if a little flour was added to the mixture passing through them: a much more even distribution of the spray is obtained and there is no necessity for washing the fruit.

Newell (W.) & Barber (T. C.). The Argentine Ant.—*U.S. Dept. Agric. Bureau of Entomology*, Bulletin no. 122, 26th June 1913, 98 pp., 12 pls., 13 figs.

In this bulletin the life-history of the Argentine Ant is given at length. It does not appear to have been regarded as a pest in its native country, but the authors cite references which show that it is a serious pest in certain parts of Brazil; its presence in Lisbon and Oporto was recorded in 1907 by N. Martins; Lounsbury recorded it at Capetown in 1908 and Reed at Concepcion, Chile, in July 1910. Details are given of its invasion of New Orleans and the neighbourhood more than 20 years ago, and there seems to be every reason for supposing that it was introduced into the city by means of the coffee ships from Brazilian ports. The senior author noticed colonies of this ant in the woodwork of the steamer which carried him from New Orleans to New York in July 1911 and another species, *Prenolepis longicornis*, was found in great numbers on board a fruit steamer from Guatemala in January 1912.

The distribution of the ant in California is discussed in detail, with a map, and also its general distribution in the United

States, 14 of which are more or less infested, the largest un[illegible] area being around New Orleans, with one or two isolated coun[illegible] in the neighbouring states. The authors say that the distrib[illegible] tion has a clear connection with the railroads, and that the on[illegible] places remote from railroads where the pest has been discover[illegible] are on the banks of the Mississippi River below infested localit[illegible] they account for this by supposing that the ants have been carr[illegible] on driftwood which has stranded and so established new fo[illegible] The distribution apparently is not affected by extreme variatio[illegible] in annual rainfall nor of mean surface temperature.

The Argentine ants at the present time have attracted m[illegible] attention as a household pest, invading houses in wet weat[illegible] and requiring the most strenuous efforts to keep them from fo[illegible] of all kinds. They chiefly attack sweet articles, but also mea[illegible] of all kinds and, occasionally, corn meal and wheat flour. I[illegible] badly infested localities it is often necessary to place the be[illegible] posts on sheets of glass coated with vaseline or some oth[illegible] repellant in order that the occupant may sleep in peace. The[illegible] are very serious pests in shops dealing in food stuffs of all kind[illegible] and also in nurseries and on ornamental plants, as by protectin[illegible] the scale-insects and plant lice they cause very serious damag[illegible] They also seriously attack orange flowers in the groves, and [illegible] market gardens they have a habit of removing certain seeds befo[illegible] they have sprouted, lettuce seed being particularly subject t[illegible] attack. In the sugar-cane fields, in their search for the excr[illegible] tions of *Pseudococcus calceolariae*, the ants are a great nuisan[illegible] They build coverings and shelters for the scales to protect the[illegible] from storms and enemies and attend to them constantly, with t[illegible] result that the Mealy Bug thrives to an extent which is impossib[illegible] where the ants are not present. Luckily the area infested b[illegible] the Mealy Bug is at present restricted, but this insect threate[illegible] to become a more serious pest in the future, owing to the manne[illegible] in which it destroys the eyes of "seed cane" and thus prevent[illegible] sprouting. The control of the Mealy Bug therefore resolve[illegible] itself largely into the question of how to control the ant. In co[illegible] fields the aphides are far more numerous and much more generall[illegible] distributed where the ant is present. The latter also attends pla[illegible] lice upon cotton, and it has been noticed in certain fields of cotto[illegible] that the lice were abundant throughout the entire summer an[illegible] autumn, whereas during these portions of the year they ar[illegible] normally almost absent. The damage done by these ants in th[illegible] orange groves of southern Louisiana is particularly serious. Fig crops are also greatly damaged, the ripening figs bein[illegible] bored and the interior eaten. Bee-keeping on any considerabl[illegible] scale is invariably abandoned when once the ants become numer[illegible] ous, so greatly do they interfere with the bees. In poultry yards they attack the nests of sitting hens and a broken egg will attrac[illegible] such numbers that the fowls abandon their nests, while youn[illegible] chicks are frequently killed by the incessant worry. Pyrethru[illegible] powder is found to be practically useless. The only substan[illegible] which the authors say will protect sitting hens is "zenoleum" powder. Indirect injury is due to the antagonism between th[illegible] Argentine ant and certain native species: thus the Fire ant[illegible]

*Solenopsis geminata*, which is useful, in that it destroys a considerable number of Boll Weevils, is exterminated and its place taken by the far more troublesome Argentine ant.

Father Biever states that they have in many cases completely exterminated the bed-bugs in the hovels and tenements occupied by poor people in the city of New Orleans.

The authors then proceed to describe the insect at length, full details being given as to the methods of study adopted and a lengthy account of the life-history of the insect in all its stages. The nests may be found almost anywhere, provided that light and water are sufficiently excluded. The ants seldom burrow to any great depth in the ground and when they make burrows these are generally at the foot of tree-trunks or under the ridges in cane, cotton or corn fields, from 4 inches to 10 inches below the surface being the usual depth. These ants have a strong dislike to light; their sense of smell is exceedingly keen, but it is doubtful whether they possess the sense of sight or hearing, at all events to any considerable extent. Foraging ants have been found to travel about 145 feet per hour. The authors discuss the relations of the ant to other insects at length and give a list of scale-insects and aphids attended by the ants, with the trees on which they are found, and they say that these Homoptera are so thoroughly protected that it is very rarely that a ladybird is found at all on the infested tree. In one respect the ant is beneficial, in that it eats the sorghum midge *Contarinia (Diplosis) sorghicola*, Coq. Observations on the natural control of this ant have shown that a cockroach (*Thyrsocera cincta*, Burm.), which occurs in the southern United States, Mexico and Central America, eats it, but the number of ants destroyed by this insect is certainly inappreciable. Attempts were made to infest a nest with *Pediculoides ventricosus*, Newp., and the authors reared enormous colonies of these mites on larvae and then placed them in the formicaries, but found that although the mite had some effect, nothing approaching the quantity used was ever likely to occur in nature and the method was therefore useless. Attempts to infect colonies with the fungus, *Sporotrichum globuliferum*, yielded no practical results.

The authors then go on to consider artificial methods of control and repression. Various proprietary and coal tar disinfectants were tried and it was found that none of these was effective for more than two days in preventing the travelling of ants. Oil of citronella seemed to be more distasteful and was effective so long as the odour remained, but it required constant renewal. Zenoleum powder was quite effective. Pine tar, tobacco dust and sulphur were found to be of no use whatever. Bands of tanglefoot were only useful until a sufficient number of ants had been captured to form a bridge for the others. Crude petroleum was found to be on the whole the best repellent of all the liquids used. Tape soaked in a solution of corrosive sublimate and allowed to dry and fastened round the legs of tables, edges of shelves, &c., was effective for many months, provided it was kept dry. It is useless as a poison because the ants cannot be persuaded to touch their favourite foods when it is present in the

proportion of 1 to 500. The extremely poisonous nature of the substance renders it difficult of application in households. Fumigation experiments are described and experiments with poisons of various kinds. Two or three protected saucers placed about a room or under tables bearing poisoned honey, meats, &c., would effectually rid the vicinity of ants in from one to three days' time, and it was further observed that they never returned in numbers so long as the dishes of poison were kept there. Methods of keeping the ants from apiaries are described and practically consist in placing the hives upon a table with weather-boarding round the sides to protect the upper part of the legs from wet and fixing round these legs bands of corrosive sublimate tape, and below them plates of sheet zinc about 6 inches square to prevent storm water from splashing upwards. The difficulties of control in orange groves are great, but it has been found that the spread of the pest can be effectively limited by digging ditches through the groves which are kept filled with water and making special provision to prevent the passage of the ants across the necessary bridges for transit purposes. Winter trap boxes were also found to be very satisfactory. These are rough boxes 2 ft. by 2 ft. by 3 ft. filled during the latter part of October with a mixture of cotton seed and dead grass. The top is left open so that the rain would wet the contents and start decay. By cutting down the standing grass and weeds in the orchard the ants appear to be driven into these trap boxes and can then be destroyed. Hydrocyanic acid was useless, but carbon bisulphide was found to be perfectly satisfactory for their destruction. The bulletin concludes with a lengthy bibliography dating from 1868.

BEZZI (Prof. M.). **Indian Trypaneids** [Trypetids] **(Fruit-Flies) in the Collection of the Indian Museum.**—*Mem. Indian Museum*, iii, no. 3, pp. 53-175, 3 pls.

This memoir is practically a monograph of the Indian flies of the family TRYPETIDAE, and keys are given to all the genera and species. Prof. Bezzi has also compiled a list of all the Oriental and Australian species (334) hitherto described, with brief comments upon most of them. The wings of 72 species are figured.

**Report on the Botanic Station, Monserrat, for** 1911-12, pp. 7-16. Barbados, 1913.

The following pests are noted in this report. Corn Ear Worm (*Laphygma frugiperda*). Corn plants, with the exception of attack from this caterpillar, are said not to be very subject to disease. As the caterpillars burrow downwards into the unfolding leaves it is difficult to reach them with poisons. The local remedy is to throw dry earth into the heart of the plant, but careful investigations have shown that this is useless. The only insecticide which has been found to kill the caterpillars is lead arsenate, and this, when applied pure, caused scorching,

which was avoided when the poison was mixed with lime at the rate of 1lb. arsenate to 4lb. of lime and applied as a spray at the rate of ½lb. of arsenate to 4 gals. of water; but even this did not reach all the caterpillars.

Bengal Bean Caterpillar (*Thermesia gemmatilis*). Experiments have been made to ascertain whether the Bengal bean can be safely dusted with Paris green and lime with a view to controlling this pest. Paris green mixed with lime at the rate of 1lb. Paris green to 6lb. of lime was found to destroy completely the purple bonavist bean, but in all the trials, 6 in number, made with this mixture upon Bengal beans there was scorching but no defoliation. Lead arsenate used in the same proportions caused scorching.

Cotton Stainers. Two species are prevalent in the island *Dysdercus andreae* and *D. delauneyi* and both are widely distributed. Early measures of repression are said to be very necessary.

Cotton Flower-bud Maggot (*Contarinia gossypii*). Specimens of this insect were hatched at the Botanic Station and identified as the species attacking cotton in Antigua. It usually appears on the windward side of the island about December, but has been noticed in nearly all parts at different times.

The principal coconut pest is said to be the Bourbon scale (*Aspidiotus destructor*). The chief pest of the sweet potato is *Euscepes (Cryptorrhynchus) batatae*, known under the name of Scabs, which is occasionally very destructive. At Grove Station it was found that one-third of the plot was badly infested, while the remainder was practically free from the pest.

The Chaff Scale (*Parlatoria pergandei*) was found attacking citrus plants at Grove Station early in 1911. This is the first record and it is probably a recent introduction, as it has not been observed outside the station.

Lime trees are attacked by the green scale, *Coccus viridis*, and the purple scale, *Lepidosaphes beckii*. These appeared at the eastern end of the island early in 1909 and have gradually spread to the western, affecting practically all the trees. This process has occupied about two years, and the bearing capacity of the trees has been seriously affected; in the year under review the condition of the trees at the western end has declined owing to serious scale attack and three trees have died at the experiment station.

McNaught (Major J. G.). **Temperature reached in Army Biscuits during Baking.**—*Jl. Roy. Army Med. Corps, London*, xxi, no. 1, July 1913, p. 136.

With reference to an article on this subject in the June number of the R.A.M.C. Journal [this *Review*, Ser. A, pp. 292-294] the writer wishes to draw attention to a statement by Decaux ('Les parasites du biscuit de troupes, moyens de préservation,' Arch. de Méd. Milit, 1872, Revue d'Hygiène, 1893, p. 156) referred to in Lemoine's 'Traité d'hygiène militaire' (Paris, 1911).

"Decaux has studied three varieties:—*Ephestia elutella, E. interpunctata* and *Asopia farinalis*, and has shown that these insects only frequent the cases of biscuits from the end of May to the beginning of September; hence the indication to pack the biscuits only in the intervening period of the year." If this statement were confirmed, it would apparently be a simple matter to avoid the infection of biscuits by these insects.

GRAHAM-SMITH (G. S.), FANTHAM (H. B.), PORTER (Annie), BULLAMORE (G. W.) & MALDEN (W.).—**Further Report on the Isle of Wight Bee Disease.** *Microsporidiosis.—Supplement to the Jl. of the Bd. Agric., London*, July 1913, 39 pp.

According to the authors, it may be stated with confidence that a protozoal parasite, *Nosema apis*, is the agent responsible for most of the outbreaks in which the symptoms of the Isle of Wight disease have been noticed, or in which stocks have dwindled or died without apparent cause.

*Symptoms.*—It is pointed out that certain symptoms such as the inability of the diseased bees to fly, the presence of numerous bees on the ground in front of the hives, and the gradual dwindling of stocks, are common; but many other symptoms have been recorded, and no one of them is characteristic of the disease. The only essential feature is the death of large numbers of bees, and often of the whole stock, especially during wet and cold periods of the year or during the winter months. It has been further shown that the disease is probably endemic, but that, owing to lack of observation, it often passes unnoticed in mild seasons, the loss of the bees being attributed to cold, starvation, spring dwindling, robbing, wax moth, diarrhoea, and other causes. It is only during severe epidemics that the disease attracts much notice. These epidemics are especially apt to make their appearance during cycles of wet and cold springs and summers, and may continue subsequently for some seasons.

*Modes of Spread.*—Water or moisture near hives contaminated with infected excrement appears to be the most important factor in the dissemination of the disease; nectar, pollen, or other substances collected as food may on rare occasions be infected. Infection within the hive may occur through infected water stored in the cells, the passage of wax, &c., from bee to bee, and more especially by excrement deposited by infected queens, drones, and worker bees suffering from dysentery. Pollen and honey contaminated by excrement may also cause infection.

Infection from hive to hive and from apiary to apiary is brought about mainly by the interchange of adult infected "carriers," and to a less extent by robbing (especially when the living remnants of the weak stock join the robbers), by infected swarms entering healthy apiaries, and by the occupation of old hives. Infected "carriers" are probably most important agents in spreading the disease by infecting water or food with their faeces, as well as in keeping it in existence from season to season.

The trade in bees from infected districts helps to disseminate the disease over greater areas than would be reached by natural means. Cold and wet weather, by affecting the health of stocks and affording opportunities for bees to gather contaminated moisture near hives, greatly influences the spread of the disease. Other insects associated with hives of bees, such as wax-moths, wasps, and ants, and other species of bees, may at times carry the spores of the disease, and thus play some part in their dissemination.

*Treatment and Prevention.*—There is little evidence that treatment by any of the remedies which have been suggested results in permanent cure, though amelioration of the symptoms for a time not infrequently occurs. Prevention is therefore the only satisfactory method of controlling the disease. Healthy stocks should be removed from the neighbourhood of diseased ones, and the bees should be supplied with an easily accessible supply of clean water which should be changed daily, and protected from contamination by flying bees. If necessary, the usual drinking places should be removed. Bees killed by the disease, frames, quilts, &c., from infected hives, should be burnt, and the hives should be disinfected, preferably by slight charring. The ground about the hives should be turned over and treated with lime. Diseased stocks should be destroyed as soon as the condition is diagnosed, and further, healthy bees should not be introduced into an apiary where the disease has shown itself. Driven bees and stocks from infected districts should not be imported into other districts. Finally, an endeavour should be made to build up apiaries from stocks which have escaped infection.

Die **Rebenblüten-Gallmücke** (*Contarinia viticola*, **Rübsaamen**). [The vine-flower gall-midge, *Contarinia viticola*, Rübs.]—*Luxemburger Weinzeitung*, i, no. 21, 1st July 1913, pp. 357-358.

In the course of an inspection of the vineyards at Schwebsingen (Luxemburg) practically every inflorescence showed a few buds which were conspicuous by being larger and of a paler, more yellowish colour than the others. These buds, when opened, were found to contain from two to six yellowish white and shiny 'worms' which caused the gradual dying-off of the infested buds, and proved to be the larvae of *Contarinia viticola*. The eggs are deposited by this tiny gall-midge in spring, when it may be observed to insert its ovipositor between the sepals of the vine-bud. The young larvae suck the juices from the ovary and stamens, at first accelerating the growth of the flower, but later causing it to dry up. The fully-grown larvae drop to the ground, where they pupate in early spring, the midges appearing as soon as the vine begins to show flower-buds. This year (1913) the gall-midge is occurring in large numbers and the damage is estimated at one-tenth of the crop. The appearance does not seem to be quite so disastrous in vineyards treated with nicotin sprays, but experiments regarding the control of *Contarinia* have not yet been made.

FINMER (F.). **Zur Bekämpfung des Heu- und Sauerwurms im Luxemburger Weinbaugebiet.** [The control of the vine moth in the Luxemburg vine-growing district.]—*Luxemburg. Weinzeitung*, i, no. 21, 1st July 1913, pp. 351-355, 1 plate.

*Clysia ambiguella* is by far the most formidable of vineyard pests in Luxemburg and the most difficult to control. Of all the sprays experimented with, nicotin has proved to be the most satisfactory, partly because it asphyxiates the moths on the wing and partly on account of its value as a stomach poison. As nicotin is volatile and rapidly loses its poisoning power it is essential to spray before the caterpillars have entered the blossoms or grape-berries. The best results have been obtained when the spray was applied at the time when the moths are most numerous, which practically always coincides with the first appearance of the caterpillars. As the date varies in different localities, vine-growers have to use their own discretion rather than act according to fixed rules. It is advisable to hang up vessels containing cider or fermenting wine as traps for the moths and as indicators of the right moment for spraying. A spray containing 1·33 kilograms of nicotin in 100 litres of Bordeaux mixture, or if greater wetting power is desirable, 1·5 per cent. nicotin and 1·5 per cent. soft soap, may reduce the ravages of the pest to a negligible quantity. A coloured plate illustrates the different stages in the life-history of the vine moth, and the damage to vine blossoms and grapes.

THEOBALD (F. V.). **The British Species of the Genus *Macrosiphum* Passerini. Pt. 1.**—*Jl. Econ. Biol.*, viii, no. 2, 1st July 1913, pp. 47-94, 30 figs.

So far fifty-five species, of which twelve are new, of the Aphid genus *Macrosiphum* are recorded for Britain. The list of British species is followed by a list of host plants with the species which affect them, and by a detailed description of 25 of the latter.

HEWITT (T. R.). **Notes on the Occurrence of the Woolly Aphis, *Schizoneura lanigera*, in the Core of Apples.**—*Jl. Econ. Biol.*, viii, no. 2, 1st July 1913, pp. 95-98, 1 fig.

On 20th January the author received for examination the core of an apple, a 'Newtown Pippin' from California, sold in the Dublin fruit market, and found it to be infected with *Schizoneura lanigera*. Other apples of the same variety were infected by this aphid, and, except for a little mildewy appearance of the eye, they seemed quite healthy. There was a small channel connecting the eye with the core in these apples and through this channel the aphids gained access to the core; this channel, however, is not common in many varieties. The core presented a white, mouldy appearance, due to the woolly secretions of the aphids and to the growth of some fungus, which was probably secondary. In one

apples which was rather more badly infected than the others, the seeds presented a damaged appearance, but the flesh of the apple was not injured in any instance. Only one or two adults were found in each core, the others being immature forms. There does not seem to be any record of the woolly aphis attacking the core, but its occurrence in this manner is probably more common than is known. It would be not only a convenient method of hibernation, possibly enabling the species to propagate during the winter, but also a means of spreading the pest from one district to another. The author, further, discusses the observations of Patch, Stedman, Marlatt, Theobald and Lohrenz on the hibernation of *Schizoneura*.

COLLINGE (W. E.). **Collembola damaging Pine Trees.**—*Jl. Econ. Biol.*, viii, no. 2, 1st July 1913, p. 99.

A number of shoots of *Pinus sylvestris* submitted to the author showed a falling off of the opening buds. The young needles had a dry, withered appearance in some cases, but still retained their connection with the shoot, whilst in others they immediately fell away on being handled. A dissection of a few partially damaged buds revealed a number of specimens of a Collembolan, *Sira nigromaculata*, Lubbock, and on further investigation every damaged bud was found to contain five or six examples. The insect seems to be attracted by the resinous gum, and, as soon as the leaf-bud opens, makes its way to the bases of the young leaves and commences to bite into them: after a short time the needles turn yellow and ultimately fall away. Sometimes only part of the base is destroyed, and part of the bud remains in a damaged condition, but in most cases the buds are completely ruined. The scattering of naphthalin around the base of the stem or smearing it with some sticky material in the autumn would probably keep the trees free from these insects.

FEYTAUD (Dr. J.). **Les ennemis de l'osier; la grosse Chrysomèle rouge, *Lina* (*Melasoma*) *populi*, Linn.** [The enemies of the Osier: the large red Chrysomelid, *Lina populi*, L.]—*La Revue de Phytopathologie Appliquée*, i, no. 3, 5th July 1913, pp. 37-39.

The author says that CHRYSOMELIDAE are perhaps the commonest pests of the osier. The genera *Lina*, *Phratora*, *Phaedon* and *Plagiodera* seem to be more or less restricted to willows, poplars, aspen, alder and birch; *Lina populi* passes the winter in the adult stage in various sheltered places, coming out about April, just at the time when the osier begins to put forth its first leaves. The eggs are laid in groups of 10 to 20 on the leaves and hatch in about 10 days, the larvae immediately attacking the parenchyma of the leaf. There are three generations in the year, and damage is done by both the larva and perfect insect, which eat the leaves of poplars and willows, only the large veins

being left. In the Gironde *Salix fragilis* and *S. viminalis* are specially cultivated and the author says that *L. populi* attacks almost exclusively the latter species and is sometimes so abundant that the leaves are completely destroyed as fast as they appear with a result that the osier grows badly and yields an inferior product. The larva is parasitised by a Tachinid fly, *Erycia dubia*. The author suggests as a remedy, the use of sheltered traps placed here and there in the osier beds to attract the hibernating insects, which may be collected and destroyed in January and February. The beetles can also be easily captured in the spring, but the process is lengthy and expensive, as it requires continual repetition. Insecticides containing nicotin give excellent results, because they not only poison the insects and the larvae, but also prevent oviposition. In 1908, the author made a definite experiment as follows:—He took a plantation of red osier (*Salix fragilis*) containing plants of the same age (14 years) and divided it into four equal areas of 120 square yards each; one was left untreated as a control; another was sprayed with Burgundy mixture; another with a nicotin formula, but without copper; and the third with Burgundy mixture containing the same proportion of nicotin as no. 2, viz. 1·3 per cent. The three squares were each treated six times and on the same days. Soon after the spraying was commenced obvious differences developed between the four plots. In September the sprayed plots were very much more vigorous than the control, and the best result was obtained on the plot treated with copper mixture and nicotin. The quantities of osier produced were as follows:—no. 1 (control), 80 kilos worth 5 frcs.; no. 2 (copper mixture), 89 kilos worth 7 frcs.; no. 3 (nicotin mixture), 97 kilos worth 9·50 frcs.; no. 4 (copper and nicotin), 141 kilos worth 14·50 frcs. The author adds that a fungus (*Melampsora*) which causes the leaves to fall prematurely was also controlled by the treatment.

GUILLAUD (E.). **La mouche à scie des rosiers.** [The Rose Saw Fly.]—*La Revue de Phytopathologie Appliquée*, i, no. 3, 5th July 1913, pp. 41-42.

The yellow fly or rose saw-fly (*Hylotoma rosae*, L.) commences to appear in the middle of May. The eggs are generally laid early in the morning at an inch or so from the end of a young branch, in the tender bark of which the female drills a hole, placing an egg in it and covering it with a bitter frothy liquid. The operation is repeated perhaps 15 to 20 times on the same branch. From 10 a.m. to about 5 p.m. the flies are not seen about the rose trees. They go to seek food on other plants and may be caught on beetroots, carrots and especially parsley in flower. The frothy liquid which the insect squirts over the eggs is very corrosive and the plants covered by it become brown and hard, and their development is arrested, causing curvature of the branch. The buds at the ends of these branches cease to grow and very rarely open. The larvae hatch in about 15 days, and after feeding upon the leaves descend into the earth to pupate.

[There] are two generations, one in May and June and another, [and] more numerous, in August and September, which hibernates [in] the pupal stage. The damage done by this insect is very great, [but] not all varieties of rose trees are attacked to the same degree, [some] roses being less subject to attack than other varieties.

The rose *Hylotoma* is parasitised by certain Chalcids, viz. *...modus hylotoma, Eulophus incubitor, E. hylotomarum* and *...gnator.* Wasps and insectivorous birds also destroy large [num]bers, but unfortunately the natural enemies are far from [suffi]cient to keep down the pest.

Amongst the remedies recommended are, the thorough stirring [of] the earth around the trees, so as to expose the cocoons, and the [cut]ting away of all those branches which show the characteristic [...]hing and the brown scar at the point of curvature; these [bra]nches, which contain the eggs of the sawfly should be imme[di]ately burnt. The larvae may be destroyed by spraying at the [en]d of May and at the end of August with the following mix[ture]:—Water 1 litre, carbonate of potash 5 grms., soft soap 10 [gr]ms., linseed oil 15 grms.; the soda and soap are first dissolved in [boi]ling water and when cold the oil is added slowly with constant [stir]ring. M. Margottin, as a result of his observations on the [fee]ding of the insects, has suggested the planting of curled [p]arsley, the flowers of which are particularly attractive to the [saw]flies, which can be easily caught by hand when visiting them.

**La mouche des carottes.** [The Carrot Fly, *Psila rosae*, F.]—*La Revue de Phytopathologie Appliquée*, i, no. 3, 5th July 1913, p. 43.

During the present year this insect has done considerable [d]amage to market gardens in the south of France. The remedy [su]ggested is to spread sand, which has been previously soaked in [pe]troleum or carbolic acid, between the lines of plants. This [ke]eps away the females at the time of oviposition. In autumn [th]e ground should be well stirred and turned over to bring the [pu]pae to the surface. All plants which have turned yellow [sh]ould be pulled up and given to cattle at once or boiled. It must [no]t be forgotten that celery, parsley, turnips and allied plants [a]re all equally subject to attack.

[S]CHNEIDER-ORELLI (O.). **Zur diesjährigen Sauerwurmbekämpfung.** [This year's campaign against the vine moth.]—*Schweiz. Zeits. für Obst- und Weinbau, Frauenfeld*, xxi, no. 13, 8th July 1913, pp. 200-201.

In many vineyards of Eastern Switzerland the infestation by [th]e first generation of the vine moth has been more severe this [ye]ar than in 1912, so that direct methods of control will have to [be] resorted to, in order to check the second generation. The use [i]s recommended of traps consisting of wide-mouthed preserve jars [co]ntaining dilute fruit wine (pear cider) and hung to the vine-[st]akes at a distance of six to twelve yards apart. Last year on an

average 51 vine moths of the second generation were captured in each jar, while only two moths per jar were trapped when the first generation was on the wing; this year three to four per jar were caught in spring, and of these four-fifths were females.

There is a marked reduction in the occurrence of *Polychrosis botrana*, especially in the vineyards of Lake Zürich, and *Clysia (Conchylis) ambiguella* preponderates in numbers. Probably the continual rain last year was detrimental to the warmth-loving *Polychrosis*, because in vineyards where this species preponderated last year the balance has been turned in favour of *Clysia*.

SCHNEIDER-ORELLI (O.). *Epitrimerus piri* **infesting Pear Leaves.** —*Schweiz. Zeits. fur Obst- und Weinbau, Frauenfeld*, xxii, no. 13, 8th July 1913, p. 208.

Pear leaves sent to the Swiss Experiment Station at Wädenswil for examination were found to be badly infested with small mites, *Epitrimerus piri*, which cause the leaves to curl. It is probable that this pest hibernates in the buds and already infests the leaves when they begin to sprout. The mites leave them in autumn before they fall, but spraying would not be feasible as it is difficult to determine the proper time. It is advisable to pick and burn infested leaves, as thereby it is possible to control the mite without unduly damaging the tree.

PICARD (F.) & BLANC (G. R.). **Les infections à coccobacilles chez les insectes.** [Coccobacillus infections in Insects.]—*C. R. Hebd. Acad. Sci., Paris*, clvii, no. 1, 7th July 1913, pp. 79-81.

Since the authors' first communication on the *Coccobacillus* of *Arctia caja* [*see* this *Review* ser. A. p. 166] they have made further experiments on other insects, and have always obtained positive results with regard to the following species: COLEOPTERA: *Porcilus koyi*, *Opatrum sabulosum*, *Cetonia aurata*, *Melolontha vulgaris*, *Anoxia australis*, *Chrysomela sanguinolenta*, *Cleonus mendicus*; HEMIPTERA: *Eurydema ornata*; ORTHOPTERA: *Periplaneta orientalis*, *Epacromia strepens*, *Acridium aegyptium*; LEPIDOPTERA: caterpillars of *Arctia caja*, *Porthesia chrysorrhoea* and *Bombyx mori*. This list could no doubt be extended indefinitely, since it is probable that the majority of insects are killed by *Coccobacillus cajae*. It is of interest to note that while the virus is fatal to the majority of Coleoptera, aquatic beetles (*Hydrophilus* and *Dytiscus*) are immune. The authors found that a *Bacillus* most probably identical with that recently described by Chatton [*see* this *Review* ser. A. p. 306] as *B. bombycis* is fatal to the beetle *Anoxia australis*. Finally, they discovered in caterpillars of the gipsy moth (*Lymantria dispar*), which are this year exceptionally abundant in Southern France, a fatal septicaemia caused by a *Coccobacillus*, for which the name *C. lymantriae* is proposed. The authors were able to prove without doubt that, in the case

of *Arctia caja* at least, it is possible to kill the insect with a few drops of the *Coccobacillus* culture introduced into the alimentary canal without finding a trace of the virus in the blood. The problem concerning the virulence of the *Coccobacillus*, however, is not yet settled, but it is possible to irritate the digestive tube of the host to such an extent by an injection into the circulatory system that *Arctia caja*, as well as frogs, died with symptoms of violent diarrhoea and prolapsus of the intestine. On the whole, the species, or varieties (races), *B. cajae*, *bombycis*, *melolonthae* and *lymantriae*, differ from *Coccobacillus acridiorum*, d'Hérelle, in that the latter is always fatal to the locust if ingested but innocuous to the silkworm.

**J. D. Nikotin und Conchylin sind wirksame Bekämpfungsmittel des Heuwurms.** [Nicotin and "conchylin" are effective means of controlling the Vine Moth.]—*Luxemburger Weinzeitung*, i, no. 22, 15th July 1913, pp. 369-373.

According to numerous experiments made in Luxemburg under the direction of the Viticultural Commission, sprays containing nicotin or 'conchylin' (a preparation sold by a Berlin firm) are effective against the vine moth (*Clysia ambiguella*) to such an extent that viticulture may again be carried on with a profit. The price of 100 litres of spray consisting of 1·5 kilograms each of nicotin, cotton-oil soap, copper sulphate and lime is 4·91 marks, whereas an equal quantity of spray containing 20 litres of conchylin (at 0·70 marks), 1·5 kilograms each of cotton-oil soap, copper sulphate and lime costs 15·46 marks. The relative efficacy of the two sprays has yet to be tested.

Moreau (L.) & Vinet (E.). **La Cochylis: constatations actuelles; traitements d'été.** [Reports on *Clysia ambiguella* and its summer treatment.]—*Bull. de la Société des Agriculteurs de France*, 15th July 1913, pp. 55-56.

Vineyard owners report with surprise a serious invasion of Cochylis, and especially in the West of France the damage done by the first generation is already serious, causing cultivators much anxiety as to possible damage by the second generation. The authors say that many owners have neglected to treat their vineyards either because they did not believe in the efficacy of insecticides, or because the moths have arrived almost unperceived, and in many cases nothing has been done to discover their presence. They insist upon the necessity of setting up traps in the vineyards as soon as the moths are seen, as guides to the seriousness or otherwise of the invasion and say that in their own experimental vineyard the use of traps enabled them to predict a serious attack by Cochylis, and further that this might have been predicted last autumn. One of the authors in a paper read at a meeting of the Viticultural Section of the Society in February, said "after the harvest very many Angevin vineyard owners noted with some surprise the presence of numerous larvae of Cochylis on their vineyard tackle and about

the press-house, a sure sign that the pest was already present in the vineyards in large numbers" and suggested that they should redouble their vigilance.

The authors recommend that traps should be set up for the second flight of moths, and that the grapes should be sprayed when the flight of the moths is at its height, with copper wash containing nicotin (133 grms. of the alkaloid to the hectolitre (0·133 per cent.) made slightly alkaline). The difficulties presented by this spray treatment are considerable, and it can only be carried out in those vineyards where the vines are not overgrown, and by proprietors who have a qualified staff at their disposal; if the work cannot be carried out properly it is better to dust the vines with insect powders. They suggest sulphur with nicotin, sulphur with naphthalin (15 per cent. of naphthalin in powder), sulphur with lysol, or sulphur with pyridin, mixtures of sulphur and hydraulic lime, etc.; these dustings to be supplemented by the free use of traps. The authors say that, in 1912, in their experimental vineyard by setting one trap to every five or six vinestocks in every 10 to 15 rows and by directing the dusting in such a manner as to drive the moths towards the traps, they captured 1,500 moths in the summer in 15 traps made out of an ordinary glass containing waste wine with a drop of vinegar. They further say that all that can be hoped for is to reduce the summer generation as much as possible. It cannot be entirely destroyed by any known means and operations against this generation are not to be compared in efficacy with a well organised attack on the spring generation. In their own experimental vineyard in this year they have been able almost completely to destroy Cochylis by operations in spring.

Dalmasso (G.). **L'estratto di tabacco contro le tignole dell'uva.** [Tobacco extract against the Grape Moths.]—*La Rivista di Viticoltura, Enologia ed Agraria, Conegliano*, xix, ser. v, no. 14, 15th July 1913, pp. 330-331.

The author says that insecticides in general do not give regular and uniform results, especially when applied on a large scale, and he regards tobacco extract combined with Bordeaux mixture as the best spraying fluid, although by no means an ideal remedy. He refers to Catoni's experiments and points out that the results obtained are hardly proportionate to their cost. [See this *Review*, ser. A, pp. 250-251.]

**Insetti che daneggiano le foglie del pero.** [Insects which damage the leaves of pear trees.]—*Rivista di Agricoltura, Parma*, xix, 18th July 1913, p. 461.

*Luperus rufipes* and *L. flavipes* are reported by a correspondent of the paper as damaging the leaves of his pear trees. He is advised for small or special trees to spray with a 3 per cent. solution of carbolised extract of tobacco and for a large number of trees to use a spray made of 1 kg. of petroleum, 2 kgs. of soft soap and 100 litres of water (1, 2 and 100 parts by weight respectively).

**Vidal (Dr.). Insectes nuisibles aux artichauts.** [Insect pests of artichokes.]—*La Vie Agricole et Rurale*, ii, no. 33, 19th July 1913, p. cclvii.

The author points out the danger which exists in those districts in which this vegetable is cultivated on a large scale of an extraordinary invasion of *Vanessa cardui* and also of a Noctuid, which he believes to be *Xanthoecia flavago*, Schiff. The caterpillars of the former live entirely upon the parenchyma of the leaves on the upper surface. It has been remarked that everywhere where the artichoke leaves have not sufficed for the food of the swarms of larvae they have migrated to cardoons. The swarms make their appearance about the time when the growth of the artichoke plants is complete in the South of France, and the damage consists in stripping the leaves and preventing the maturation of the heads. Spraying and dusting with insecticides appear to be absolutely without effect. Arsenical sprays have not been used and the growers have been driven to cutting off the attacked leaves and burning them. M. Bénard of the Muséum d'Histoire Naturelle has examined a large number of pupae of *Vanessa* collected from artichoke gardens and has discovered that almost everyone is parasitised by a Chalcid.

Unfortunately this is not the case with the second pest abovementioned, which has become exceedingly serious because it attacks, in the late season of growth, the stems which support the artichokes and the artichokes themselves. The period of ripening of the artichoke coincides with the development of this Noctuid, the larva of which, beginning in the axil of the leaves, bores into the stem and eats out the pith, so finding its way into the interior of the flower. Its attack is occasionally made also either from within or from without upon the capitulum or the bracts. The life-history of this pest has not yet been properly studied, and the author says that the only method at present of dealing with it is to examine the plants carefully and to burn any branches which appear to be attacked.

**Richardson (C. H.). A New Braconid of the Genus *Microdus* from Canada.**—*Canadian Entomologist*, xlv, July 1913, p. 211.

The author describes a new Braconid, *Microdus ocellanae*, bred from the bud moth (*Tmetocera ocellana*, Schiff.) at the Dominion Entomological Laboratory, Bridgetown, Nova Scotia.

**McDunnough (J.). Concerning the Reputed Disastrous Occurrence of *Vanessa californica* in Oregon and California.**—*Canadian Entomologist*, xlv, July 1913, pp. 233-235.

The author is of opinion that the recent outbreaks described by F. M. Webster of the Bureau of Entomology, Washington [see this *Review* ser. A, p. 177], are in all but the last case not due to *Vanessa californica*. He says that it is a well known fact that the larvae of the various species of *Vanessa* are restricted to

one or two food-plants, and that it would be very extraordinary if, whilst normally restricted to *Ceanothus*, a Vanessid larva should suddenly be found devastating alfalfa and garden vegetables. But in the case of the attack reported from Wash., Oregon, the food-plants mentioned indicate that the larvae were probably those of *Vanessa californica*.

Meyer (H.). **Anmerkungen über Entwickelung von** *Sitophilus (Calandra) granarius*, L. [Remarks on the development of *Calandra granaria*.]—*Entomologische Zeitschrift, Frankfurt a. M.*, xxvii, no. 16, 19th July 1913, pp. 87-88.

The author succeeded in rearing two generations of this insect from specimens received from a malt factory in which they did much damage to stored barley. The beetles live for upwards of a year. They are very careful not to attack any grains of barley and rye which are already tenanted by larvae.

Green (E.). **Catalogue of Isoptera (Termites) recorded from** *Ceylon*. *Spolia Zeylanica*, vol ix, part 33, 1913, pp. 7-15.

The author says that this list must not be taken as complete. Little attention has been given to this order of insects in Ceylon, and collections have been made in a few localities only, so that probably the range of several species is more extended than it appears.

Hoffmann (—). **Obstbaumdüngung, ein Hilfsmittel im Kampfe gegen einige tierische Baumschädlinge und gegen ungünstige Witterungsverhältnisse.** [The manuring of fruit-trees, an aid in combating tree-pests and adverse climatic conditions.]—*Schweiz. Zeits. fur Obst- und Weinbau, Frauenfeld*, xxii, no. 14, 22nd July 1913, pp. 218-220.

This paper, reprinted from the "Deutsche Obstbauzeitung" deals with an experiment made at Germersheim (Pfalz), where large numbers of plum trees were destroyed in 1912 owing to the ravages of *Scolytus pruni*, *S. rugulosus* and *Xyleborus dispar*. Experimental plots containing about 24 plum trees were manured with different fertilisers, with the result that on the plots treated with stable manure, potassium nitrate and nitro-phosphates all the trees were saved. Plots treated with potassium phosphate showed a loss of 8½ per cent., with lime only, 16⅔ per cent., whereas one-third of the trees untreated with manure were destroyed by insect pests. The trunks of the trees in all the plots were treated alike with lime-wash twice annually. The greater resistance of the manured trees may be due to the fact that their woody tissues grow more rapidly, thus causing the tunnels of the insect pests to be closed up. The influence of manuring on resistance to frosty weather is also discussed.

**Bruner (L.). South American Locusts** (*Acridoidea*). **ii.**—*Ann. Carnegie Museum, Pittsburgh*, viii, nos. 3-4, March 1913, pp. 423-506.

The paper is based chiefly on a collection of locusts made by J. Steinbach in eastern Bolivia and south-western Brazil. Altogether 130 species are described, and a number of synoptical tables of genera and species are included.

**Baker (C. F.). A Study of Caprification in** *Ficus nota*.—*Philippine Jl. Science*, viii, D, no. 2, April 1913, pp. 63-83, 4 figs.

The fact that Smyrna figs can only be produced through the agency of certain Chalcidoidea, which perform for the figs the act of cross-pollination, has for a long time been exploited for the building up of large businesses, *e.g.*, in California, involving many thousands of dollars. The careful investigation of the symbiotic relationship between plant and insect has brought many interesting facts to light, and superficial observations in Cuba and in Brazil had previously indicated to the author the astounding extent and the very varied possibilities of this subject. The number of known species of figs is said to be above five hundred. In many of these the character of the caprification phenomena varies widely, and many of the insects involved seem to be quite confined to certain species of figs.

The author had excellent opportunities for observing the caprification of *Ficus nota*, which is common throughout the Philippines, at Los Baños, and gives a full account of the process.

The following insects are noted as occurring in this species of fig. *Blastophaga nota*, sp. n., is the normal inhabitant of the gall flowers and the active caprifier. *Agaonella larvalis*, g. n., sp. n. is common in *F. nota* and probably a guest in its relation to the *Blastophaga*. *Sycophaga nota*, sp. n., is not at all common at Los Baños and probably a guest. *Sycoryctes philippinensis*, sp. n., occurs in great numbers in November in gall figs and is probably parasitic in its relation to *Blastophaga*. The same may be said of *Philotrypesis ashmeadii*, sp. n. *P. similis*, sp. n., is common, and *P. collaris* occasional.

**El Gusano de la Sandia** (*Citrullus vulgaris*). [The Citrullus (Water Melon) Worm.]—*Boletin de Fomento, San José, Costa Rica*, no. 2, 1913, pp. 139-140.

This pest, *Diabrotica vittata* (?) attacks the young plants just as they are beginning to grow, the larva at the same time destroying the roots. Another beetle, *Crepidodera cucumeris*, also gnaws the upper surface of the leaves in irregular patches, and the larvae tunnel into the parenchyma. The following remedies are suggested against these pests:—Manuring with nitrate of soda, so as to cause the plants to grow rapidly and acquire a capacity for resisting the attack, and spraying the plants with Paris green in the proportion of 4 oz. in 50 gallons

of water, two or three times at intervals of a week. These plants are also said to be attacked by *Aphis gossypii*, and against this pest, which often accompanies those previously mentioned, spraying with a mixture of 1 part of petroleum and 20 parts of water is recommended; that is to say, if an arsenical spray has been used, say, on Monday, the plants should be sprayed on the Thursday with the petroleum mixture and the method kept up for two or three weeks.

HEIKERTINGER (F.). *Psylliodes attenuata*, **Koch. der Hopfen- oder Hanf- Erdfloh. Pt. 2.** [The Hop or Hemp Flea-beetle, *Psylliodes attenuata*, Koch.]—*Verh. der K. K. Zoologisch-botanischen Ges. Wien*, lxiii, nos. 3 & 4, 20th June 1913, pp. 98-136, 20 figs.

This paper forms a continuation of one bearing the same title by Prof. F. Tolg [see this *Review*, ser. A., p. 245]. Following the description of the morphological characters of *Psylliodes attenuata* is a discussion of the distribution of the species. It does not seem to occur in the extreme north or south of Europe, but has been recorded from England, France, Netherlands, Germany, Central Russia, Turkestan and Eastern Siberia; and from Northern and Central Italy, Croatia, Dalmatia, Servia, Bulgaria, Rumania, Southern Russia and Caucasus.

The hop flea-beetle is stated to feed only upon hop and hemp, and occasionally upon nettle. The author criticises Chittenden's characterisation of the American species (*P. punctulata*) as being a 'general feeder,' and is of the opinion that no palaearctic Halticine is polyphagous, each of the plant families mentioned by Chittenden having its separate species of flea-beetle, and that a different behaviour on the part of nearctic species is improbable.

The author reiterates the statement of Prof. Tölg that *P. attenuata* only produces one generation during the year. The habits, in particular the method of jumping, of this flea-beetle are discussed. The suggestion of Theobald that oviposition occurs in the hop cones and that the larvae live in them is incorrect. The opinion is expressed that a number of insects accused of being hop pests (*Chaetocnema concinna*, *Phyllotreta* sp.) are only casual feeders on that plant. The paper concludes with a résumé of control methods and a bibliography of the principal papers on *P. attenuata* and *P. punctulata*.

BIRD (H.). **The Passing of the Hickory Nut?**—*Jl. New York Entom. Soc.*, xxi, no. 2, June 1913, pp. 123-126.

Many hundred hickory trees in Rye, N.Y., are dead or dying owing to the attacks of the hickory bark borer, *Scolytus quadrispinosus*. The beetles emerge from the last days of June to the middle of July; they do not mate at once, but flock around the trees, or fly to new territory. They feed on the bases of the leaf petiole where they mine a cavity large enough to crawl into, and

this subsequently causes the leaf to fall. They often mate in these borings. Before ovipositing the females chew a hole through the bark to the sapwood, usually on the upper third of the tree. The boring is enlarged underneath the bark, and the eggs placed in this cell. The larvae hatch out about the middle of September, and remedial measures ought to be carried out before they start on their destructive work of girdling. A spray of whale oil soap is recommended as a repellant, but the safer method is to squirt gasolene with a small oiler into the holes leading to the egg cells. The beetles invariably select trees of weakened vitality.

Hood (J. D.). **Two New Thysanoptera from Porto Rico.**—*Insecutor Inscitiae Menstruus*, i, no. 6, Washington, June 1913, pp. 65-70.

Two species of thrips collected by T. H. Jones, of the Sugar Planters' Experiment Station at Rio Piedras, P.R., were identified by the author as *Heterothrips sericatus*, sp. n., and *Podothrips semiflavus*, sp. n. Specimens of the former were collected from flowers of guava (*Psidium guajava*) and the latter from 'para grass' or 'malojillo' (*Panicum barbinode*). Mr. Jones mentions that accompanying *P. semiflavus* between the leaf-sheaths and stalks of the grass, there occurred a scale-insect, identified by E. R. Sasscer as *Odonaspis* sp. Along with this scale occurred specimens of *Targionia sacchari* (Ckll.).

Busck (A.). **New Microlepidoptera from British Guiana.** *Insecutor Inscitiae Menstruus*, i, no. 7, Washington, July 1913, pp. 88-92.

Among the Microlepidoptera received by the author from H. W. B. Moore, of British Guiana, the following may be of economic importance. *Cryptolechia flava*, Zeller, was bred from coffee at Mocha, B. G. The larva of *Blastobasis lecaniella*, sp. n., found at Nonpareil, B.G., feeds on scale-insects, *Lecanium* and *Ceroplastes*, on old roots of lime and guava. A *Gracilaria* l., bred from 'pigeon-pea' in Georgetown, could be differentiated from *G. violacella*, Clem., which feeds on *Desmodium* in North America.

Meyrick (E.). **A Revision of New Zealand Pyralidina.** *Trans. & Proc. New Zealand Inst.*, 1912, xlv, 9th June 1913, pp. 30-51.

The Pyralidina form 22 per cent. of the entire lepidopterous fauna of New Zealand, probably a larger proportion than in any other region, and a few of them are of great economic interest. *Meliphora grisella*, F., was found at Nelson and Christchurch, the larvae feeding on wax in beehives, to which they are often injurious, and on dried apples. The larva of *Hymenia fascialis*, Cram., occurring in Auckland, also in Australia and throughout the warmer parts of Asia, Africa and America, feeds on Cucurbitaceae (melons, &c.) in gardens. *Diplopseustis perieresalis* occurs

near towns (Auckland, Wanganui, Christchurch) and is probably attached to some cultivated plant. *Pyralis farinalis*, the larva of which lives on flour and corn-refuse, was found near Christchurch.

FLETCHER (T. B.). **Rice-Bug.**—*Madras Agric. Calendar*, 1913-14, p. 21, 1 fig.

The Rice-bug (*Leptocorisa*), well known as "bambuchu" in South Kanara, is a slender greenish insect which often does great damage to paddy crops by sucking out the milky juice of the young grain, so that no proper grain is formed. When sufficiently numerous to do damage, the bugs are easily caught in hand-nets made of thin cloth and there crushed with a stone or stick. As the bugs also feed on the seeds of wild grasses, &c., all such weeds should be cleared away from field-bunds whilst the paddy is still young; otherwise the bugs will live on the grass and attack the paddy when it comes into ear.

FLETCHER (T. B.). **Grasshoppers.**—*Madras Agric. Calendar*, 1913-14, p. 17, 1 fig.

The best remedy against grasshoppers is to catch them in bag-nets as soon as they are noticed to be doing damage, especially in the case of young crops. The net is a bag of cloth 3 or 4 feet wide by 2 feet at the mouth and 5 or 6 feet deep and tapering to a point behind. The mouth of the bag is fitted with two short bamboo poles at the sides to hold the bag with and a bamboo piece to support the lower edge. The end of the bag is weighted with a stone to prevent it blowing upwards. Two men should take the bag, holding it by the upper ends of the bamboo side-pieces, and should sweep it over the crop as quickly as possible, against the wind, if any be blowing. At the end of each run the grasshoppers may be shaken down into the bottom of the bag and destroyed.

FLETCHER (T. B.). **Hairy Caterpillars** (*Kumblihula*).—*Madras Agric. Calendar*, 1913-14, pp. 36-37, 1 fig.

In some districts Hairy Caterpillars (*kumblihula*, *kambipuchi*) do much damage to ground nuts, pulses, cholam, cumbu, &c. The moths generally appear when the first monsoon rains set in and lay their eggs on the leaves; the larvae hatched from these eggs (each female may lay several hundreds) pupate in the ground. If the caterpillars are coming on to crops after eating all the weeds on field-bunds or waste places, the crops may sometimes be saved by digging a narrow steep-sided trench around the edge of the field and strewing fresh leaves or branches in it; the trench must be examined every day, the caterpillars killed, and fresh leaves laid down. In districts in which these larvae occur regularly, the best plan is to catch the moths when they emerge after the first monsoon showers. They may be caught in light traps,

but the better, simpler and cheaper method is to let a boy with sharp eyes catch the white and sluggish moths. Hundreds may thus be killed in fields attacked the previous year, and the new crops saved.

**Birds: Friends and Foes.**—*Madras Agric. Calendar*, 1913-14, p. 37.

Chief among the Indian birds which eat noxious insects and which ought to be preserved by the farmer are:—The hoopoe, the common mynah, the orioles, the king crow, the crow-pheasant, the common kite, and all woodpeckers. On the other hand, the green parakeet eats grain and should be driven away.

SCHNEIDER-ORELLI (O.). *Byturus fumatus.* *Schweiz. Zeits. für Obst- und Weinbau, Frauenfeld*, xxii, no. 15, 8th August 1913, p. 240.

Young raspberries sent to the author for examination were infested with the larvae of *Byturus fumatus*. The adult beetles are responsible for the destruction of the raspberry blossoms, whereas the larvae feed on the fruit. The simplest remedy is to collect the beetles early in the morning during May and June by tapping the canes over a bag net.

SCHNEIDER-ORELLI (O.). *Omaseus vulgaris.* *Schweiz. Zeits. fur Obst- und Weinbau, Frauenfeld*, xxii, no. 16, 22nd August 1913, p. 256.

In reply to a correspondent the author states that as *Omaseus vulgaris* chiefly feeds on other insects, worms and slugs, this beetle may be regarded as beneficial. But last year it was observed to gnaw large cavities into ripening strawberries, so that an encouragement of this species does not seem to be advisable.

COX (A. J.). *Eleventh Annual Report of the Bureau of Science*, Manila, 1913, pp. 83, pl. 72.

Among the excellent photographs which illustrate this volume are several of entomological interest, such as pictures of the well equipped laboratories and entomology room; interior of the silk-house, showing ant-proof racks for the silk-worms; larva, pupa and adult of *Oryctes rhinoceros* and larvae of *Aspidomorpha miliaris*.

MOKRZECKI (S. A.). ЯБЛОННАЯ МОЛЬ ЕЯ ЖИЗНЬ И МѢРЫ БОРЬБЫ СЪ НЕЮ [*Hyponomeuta malinellus*, Zell.; its bionomics and methods of fighting it]. Simferopol, 1913, 17 figs.

*Hyponomeuta malinellus* is found everywhere in Russia, but whereas in the northern and western provinces, as for example in

Russian Poland and Lithuania, where there are numbers of apple orchards, it is not a serious pest, it is a regular annual visitant and is very injurious in the southern and south-eastern provinces. Apart from its normal yearly appearance, it multiplies there periodically, about every ten years, in enormous numbers, these cycles being due, in the opinion of the author, to the rythmic incidence of the parasites. The greater multiplication of the insects has been attributed by others to dry years, but the author cites instances of very rainy years (1896 and 1905) in which the pest was very abundant. Outside Russia this insect is found everywhere in Europe, except England, where the sea climate is perhaps unfavourable to it.

In the Crimea this insect starts flying in the middle of June, increasing daily till about the end of that month, from which date to the end of July is its period of maximum; it then decreases rapidly, but solitary specimens may be found even late in August. The ovary of the female contains about 50 mature eggs and the process of oviposition, which is fully described, lasts about an hour. The eggs are laid in groups of about 15-50 and over them the female pours out a thick yellow slime, the larvae issuing about 20 days after oviposition and remaining for the next nine months, that is until the next spring, under the shield formed by the hardened slime. In the Crimea the eggs begin to hatch about the 23rd July. The caterpillars feed first on the matter forming the shield and afterwards, usually in the autumn, and again in the spring, they gnaw the bark of the trees underneath it; during the winter they become torpid and are protected by the shields from cold and wet and from the attacks of enemies. The date of the issue of the caterpillars from the shields varies, coinciding with the unfolding of the first green leaves of the buds; during the last 12 years the earliest date was on the 22nd March in 1895, the latest 2nd May in 1896. The author describes the second stage in the life of the caterpillars, which starts after their appearance in the spring and lasts about two weeks. This is called "the mining stage," being passed by them inside the parenchyma of the leaves. From the end of April to the middle of May the caterpillars emerge from the parenchyma and then their third stage, which the author calls "the skeletonising stage," begins and lasts for about a week. After this they pass in large colonies to the ends of the branches where they settle down in a common web, gradually spreading and enlarging it in all directions. Their voracity in this stage reaches its maximum and they sometimes strip the trees in the course of a few days. The injured trees will bear no fruit that year and often also the next year and they require much attention, plenty of water, loosening of the soil round the roots and natural and artificial manuring to enable them to recover. By about the 2nd June the caterpillars are full-grown. The cocoons are massed together, usually in several layers. The first cocoons may be found in the Crimea on or about the 2nd June and the first perfect insects emerge about the middle of June. Two other species are also found in the Crimea, *H. cognatellus*, Hb. (*H. euonymellus*, Scop.) and *H. variabilis*, Z., (*H. padellus*, Hb.). The former insect was found there by the author only on *Prunus mahaleb*, although in Turkestan it also attacks apple trees.

The following list of parasites of *H. malinellus* is given:—

TACHINIDAE: *Sarcophaga affinis*, Fall., *Nemorilla notabilis*, Mg., and *Metopia tincta*, Mg.

ICHNEUMONIDAE: *Herpestomus (Ichneumon) brunnicornis*, Grv., *Pimpla examinator*, F., *P. stercorator*, Grv., *Chorinaeus cristatus*, Hlmg., *Exochus gracipes*, Grv., *E. mitratus*, Grv., *E. mansutor*, Grv., *Ascogaster annularis*, Nees, *Agrypon tenuicorne*, Grv., *Angitia armillata*, Grv.

CHALCIDIDAE: *Ageniaspis fuscicollis*, Dalm., *Pteromalus* sp. *Tetrastichus euonymellae*, Bouché.

The importance of these parasites in destroying the caterpillars of *H. malinellus* is enormous. *Herpestomus brunnicornis*, the largest of them, is not common in the Crimea and issues in the middle of June singly from the pupae of the moth. *Angitia armillata* lays its eggs singly in the body of the caterpillar, and the same applies to *Pimpla examinator*, which also parasitises *Carpocapsa pomonella* in the Crimea, and the species of *Chorinaeus* and *Exochus*. *Ageniaspis fuscicollis*, Dalm., lays about 50 eggs underneath the skin of the caterpillar.

The most primitive method of fighting the caterpillars is collection and destruction by hand, but the author does not recommend this method owing to its ineffectiveness and the damage done to the trees; and it is also expensive, the cost amounting to one rouble or more per tree for a double collection. This method can give practical results only in the case of dwarf or young trees. Instead of this, the author recommends the collection of the cocoons, which is more easily done, owing to the larvae pupating in large colonies. In order not to destroy the parasites, the author suggests collecting the cocoons and keeping them in wooden boxes covered with netting, the holes of which would allow the escape of the small parasites while arresting the moths.

Turning to insecticides, the author, in agreement with Portschinsky, doubts the effectiveness of tobacco extract as used now in the Crimea (Pastaks, containing 3·7 per cent. of nicotine and applied in a 2·6 per cent. solution in water), in destroying the caterpillars of *H. malinellus*, except in their earliest stage; while a stronger solution may prove injurious to the plants. He describes his experiments on the caterpillars in the mining stage, which he sprayed with a 1 per cent. solution of the tobacco extract, and with ½ per cent solution of kerosene emulsion, and also with ½ per cent. solution of barium chloride; after 24 hours the caterpillars sprayed with tobacco and kerosene were dead, while the barium chloride gave no useful results. The spraying of the plants at this period, as well as at the time of the unfolding of the buds, is of great practical value also against many other insects. For the later stages of the caterpillars Paris green is recommended; this is used in the Crimea in the following proportions:—1 lb. of green, 3–4 lb. of caustic lime and about 220–250 gallons of water. The author gives also a recipe recommended by Schreiner: 54 gallons of water, 12½ ozs. of Paris green, 25 ozs. of caustic lime and 4½ lb. of rye-meal. The lime must be made into a milk with water about half an hour before it is used; the green is then powdered in a copper or porcelain

mortar; the meal is boiled into a paste, and all this mixed carefully together in the prescribed amount of water, adding first the paste, then the lime through a sieve, and afterwards the Paris green.

"Azurgin," a combination of Paris green and copper salts dissolved in ammonia, is also useful and the following recipe is given. Four-and-a-half ounces of copperas are dissolved in 8 oz. of hot water and after the solution has cooled down ½ lb. of liquor ammoniae (sp. gr. 0·91) is added; then 1¼–1½ oz. of Paris green is dissolved in 4½ oz. of ammonia (this solution must be quite clear, otherwise the green is evidently not pure, which is very important); having prepared the above two solutions in glass bottles they are mixed together and about 25 gallons of water are added. In order to give sticky qualities to this insecticide a paste of rye-meal (2 to 3 lb.) can be added to it or the same quantity of treacle or gelatin (½ oz. to each 3 gallons of the insecticide). This insecticide not only kills the insects, but also checks fungus diseases, and is harmless to the plants.

"Djipsin" ($Pb_3(AsO_4)_2$) is used with good effect in many gardens in the Crimea. This insecticide is prepared by mixing $Pb\ (C_2H_3O_2)\ 3H_2O$ or $Pb\ (NO_3)_2$ with a 50 per cent. solution of sodium arsenate. The following recipe is suggested:—10½ lb. of the first-named salt, 4 lb. of the second and 110–160 gallons of water. The advantages of this insecticide are: Its gravity being near to that of water, it remains in a state of suspension, which allows of its even distribution on the leaves; its white colour shows at once whether the plants have been sprayed or not; it remains on the plants for a longer time than the other insecticides. Its disadvantages are that a supply of pure salts of arsenic is not easily obtained, and the difficulty of preparing it. Arsenate of lime is obtained by boiling white arsenic with lime in water. The author quotes the following recipe suggested by Rogozin. In a boiler of about 4 gallons capacity 2·7 gallons of water are put and to this is added 1 lb. of arsenic and 1 to 2 lb. of potash or soda (the latter is cheaper); this is boiled till the arsenic is quite dissolved, then about 3 or 4 lb. of lime are added gradually and boiling is continued for ½–1 hour. This solution is then made up to 160–270 gallons of water.

Barium chloride when used in 1 per cent. or 2 per cent. solution (4½–6 lb. of barium in about 27–30 gallons of water) is considered to be the most effective. One of its disadvantages is the want of adhesiveness, to obtain which it is recommended by some authors to add potato syrup or a solution of resin in 90 per cent. spirit; while the author recommends the addition of soda (about ¼ lb. for the above quantity). The latter transforms some of the barium into $BaCO_3$, but in his opinion the amount of barium lost in this way is not important, besides it gives the solution a white colour, thus facilitating control of the spraying. Another disadvantage is that it burns the leaves of the trees; this, although very serious, can be minimised by careful and rapid spraying. The author states that during eight years' use of this insecticide under his direction there was never a case of poisoning either of the cattle feeding on the sprinkled grass or of birds.

since 1907 the Zemstvo of Simferopol has made the fighting of this insect compulsory, leaving to the owner the choosing of the remedy. Should he fail to do this remedies are applied by the authorities and the cost charged to his account. The authorities further provide labourers skilled in spraying and also let out spraying apparatus for hire.

**Uganda Customs Consolidation Ordinance 1904: Removal of Prohibition of Importation of Coffee.**—*Uganda Official Gazette*, 31st July 1913.

The notice dated 22nd November 1910 which prohibits the importation of coffee plants (whether living or dead) and coffee, other than roasted beans and ground coffee, into the Protectorate, except with the consent of the Governor previously given in writing, has now been repealed.

Zacher (F.). **Notizen über Schädlinge tropischer Kulturen.** [Notes on pests of tropical cultivated plants.]—*Tropenpflanzer*, xvii, no. 3, March 1913, pp. 131-144, 12 figs.

The two species of Gryllidae, *Scapsipedus marginatus* and *Gryllus conspersus*, were found to damage young *Kickxia* plants in Kamerun by gnawing them round the base of the stem, causing them to die or break off. The former larger-sized species was found singly in holes in the soil round the rubber trees. The smaller species occurs in swarms and the damage is less noticeable in the rainy season.

The following pests of cotton in the Bismarck Archipelago, mentioned by Aulmann, have been received by the Kaiserliche Biologische Anstalt für Land- und Forstwirtschaft from Karazakaul: *Telephorus basicornis*, *Mordella leucospila*, *Aeolesthes sarta*, *Phloeops platypennis*, *Dysdercus sidae*, *D. cingulatus*, *Tectocoris lineola* var. *cyanipes*, *Leptoglossus australis*, *Anomala conticta*, *Phyllobius* sp. and, perhaps, *Sphingonotus yorkensis*.

According to a report from the Governor of Togo a considerable diminution of the cotton crop occurred in the Sokodé District in 1910-1911, whereas in 1911-1912 the crop was practically nil. Almost all the plants were observed to grow very well at first, but after about 3½ months the branches and the green parts of the stems began to blacken. The bolls either dropped off or showed a weak development, and a thickening was observed on the upper parts of the roots. The author found that this diseased state was not due to climatic and soil conditions, as had at first been suggested, but partly to boll-worms, probably *Diparopsis castanea*, and to two other pests, perhaps *Asthenes* sp. and *Sphenoptera* sp. Further cotton pests in Togo are *Apate monachus* and *Hypothenemus eruditus*. The best remedy against all these wood-borers is probably a spray recommended by Kränzlin, consisting of 11 lb.

sugar and ½ lb. Paris green in 8½ gals. of water. The young plants are to be sprayed when they are from 2 to 2½ feet high, and for a second time after 4 weeks. The disadvantages of the spray are its poisonous nature and the damage it causes to the leaves. Lead arsenate may on the whole be more advisable.

Mention is made of the value of the recent book by L. Peters and M. Schwartz on diseases of and damage to tobacco.

Finally the author describes the damage done to the valuable timber-tree *Monotes kerstingii* in Northern Togo by a species of *Sylepta*. The caterpillars appear in very large numbers, and will probably prove a dangerous enemy to African forestry in the future.

Brèthes (J.). **Description d'un nouvel Hymenoptère du Chili.** [Description of a new Hymenopteron from Chile.]—*Revista Chilena de Historia Natural*, xvii, nos. 1 & 2, April 1913, p. 34.

A parasite of the rose aphis was referred to the author who identified it as *Aphidius chilensis*, sp. n.

Porter (C. E.). **Notas para la zoología económica de Chile (iv).** [Notes on economic zoology in Chile (iv).]—*Revista Chilena de Historia Natural*, xvii, nos. 1 & 2, April 1913, pp. 98-99.

Prof. Porter records two insects new to the Chilian fauna which are beneficial to agriculture. One is *Coccidophilus citricola*, Brèthes, which near Santiago is controlling several species of *Aspidiotus* and was originally described as preying on *Lepidosaphes beckii*; the other is an *Aphelinus* parasitising Coccids and Aleurodids.

Hagedorn (M.). **Borkenkäfer (Ipidae), welche tropische Nutzpflanzen beschädigen.** [Bark beetles which damage tropical economic plants.]—*Der Tropenpflanzer*, xvii, no. 1, January 1913, pp. 43-51; no. 2, February 1913, pp. 99-104; no. 3, March 1913, pp. 154-160; no. 4, April 1913, pp. 211-216; no. 5, May 1913, pp. 266-270, 19 figs.

Betel (*Areca catechu*): *Coccotrypes dactyliperda*, F. (German E. Africa, Asia and Europe); *Stephanoderes arecae*, Hornung (East Indies).

Cacao (*Theobroma cacao*): *Eurydactylus sexspinosus*, Mots.; *Xyleborus fornicatus*, Eich., *X. semigranosus*, Blfd., *X. discolor*, Blfd., *X. mancus*, Blfd. (Ceylon); *X. confusus*, Eich. (Petershafen, New Guinea); *X. destruens*, Blfd. (Java, Gilolo); *Coccotrypes graniceps*, Eich. (Japan, Philippines).

Camphor-tree (*Laurus camphora*): *Xyleborus camphorae*, Hag. (Mauritius).

Cardamom (*Elettaria major*): *Coccotrypes cardamomi*, Schau... (Ceylon).

Cinchona: *Ips* (*Tomicus*) *cinchonae*, Veen (Java).

Coffee (*Coffea* spp.): *Eurydactylus sexspinosus*, Mots. (Ceylon, Burma, Sumatra, Kamerun): *Xyleborus coffeae*, Wurth (Java, Tonkin); *X. morstatti*, Hag. (German East Africa); *Stephanoderes coffeae*, Hag. (Uganda, Angola, Belgian Congo, Java); *S. hampei*, Ferrari (Antilles, Java); *Ctonoxylon amanicum*, Hag. (Kamerun); *Stephanoderes aulmanni*, Hag., on *Coffea bukowensis* (German East Africa).

Cotton (*Gossypium* spp.): *Hypothenemus eruditus*, Westwood (Togo, North America, Hawaii, New Caledonia, Guinea).

Date-Palm (*Phoenix dactylifera*): *Coccotrypes dactyliperda*, F. (Africa, Asia, Europe).

Doum-Palm (*Hyphaene* sp.): *Coccotrypes dactyliperda*, F. (German East Africa); *C. pygmaeus*, Eich., on *H. guineensis* (Kamerun).

Ebony-tree (*Diospyros ebenum*): *Coccotrypes integer*, Eich. (Ceylon).

Ivory-Plant (*Phytelephas macrocarpa*): *Coccotrypes eggersi*, Hag. (Ecuador).

Jalap-Plant (*Ipomoea purga*): *Cryphalus jalappae*, Letzner (Mexico).

Mahogany: *Xyleborus gravidus*, Blfd., *Scolytoplatypus* ...*ma*, Blfd. (Chittagong): *Trigonogenius fallax*, Hag., on *Khaya senegalensis* (German East Africa).

Nutmeg-Tree (*Myristica fragrans*): *Xyleborus fornicatus*, Eich., *Phloeosinus cribratus*, Blfd. (Penang): *Stephanoderes* ...*chatae*, Schauf. (Guadeloupe).

Rice (*Oryza sativa*): *Eurydactylus sexspinosus*, Mots. (Lower Burma).

Rubber (*Hevea brasiliensis*): *Stephanoderes congonus*, Hag., *S. heveae*, Hag., *Hypothenemus tuberculosus*, Hag. (Congo): *Xyleborus affinis*, Eich., *X. ambasius*, Hag., *X. camerunus*, Hag. (Kamerun): *X. cognatus*, Blfd. (Tonkin, Kamerun).

Rubber (*Manihot glaziovii*): *Phloeotribus puncticollis*, Chap. (Brazil, Ecuador); *Xyleborus affinis*, Eich. (Hawaii); *X. confusus*, Eich. (Belgian Congo).

Rubber (*Castilloa elastica*): *Phloeotribus puncticollis*, Chap. (Brazil, Ecuador); *Xyleborus spathipennis*, Eich. (Ecuador).

Rubber (*Ficus elastica*): *Diamerus fici*, Blfd. (Eastern Himalayas).

Rubber (*Urostigma* sp.): *Cryptarthrum walkeri*, Blfd. (Dammar Islands).

Sugar-Cane (*Saccharum officinarum*): *Xyleborus affinis*, Eich. (West Indies): *X. perforans*, Woll. (Java): *Hypothenemus eruditus*, Westwood (Nevis).

Tea (*Thea chinensis*): *Xyleborus fornicatus*, Eich. (Ceylon).

Morgan (A. C.) & Parman (D. C.). **Arsenate of Lead as an Insecticide against the Tobacco Hornworms.**—*U.S. Bureau of Entomology*, Circular no. 173, 27th May 1913, 10 pp.

The use of Paris green against tobacco hornworms (*Phlegethontius* sp.), which are a serious pest in the dark-tobacco districts of Kentucky and Tennessee, is not to be recommended, as it burns the leaves of tobacco very severely, and may reduce the value of the crop as much as 50 per cent. in exceptional cases. Instead, it is advisable to use lead arsenate, 3 to 4 lb. in 100 gals. of water, if applied as a spray, or 3½ to 5 lb. per acre, if applied in powdered form. In the latter case the lead arsenate must be mixed with a carrier, the best so far known being dry wood ashes, used in a bulk at least equal to the lead arsenate. In applying the lead arsenate powder it is necessary to use a dust-gun having a diameter of at least eight inches and to apply the powder when there is no breeze and when the dew is on the plants.

Marsh (H. O.). **The Striped Beet Caterpillar.**—*U.S. Bureau of Entomology*, Bull. no. 127, pt. ii, 19th May 1913, pp. 13-18, 2 figs., 1 pl.

Ordinarily the so-called garden Mamestra or clover cutworm (*Mamestra trifolii*, Rott.) is one of the minor beet pests in the Arkansas Valley in Colorado and Kansas, but during some years it causes considerable damage. In that locality the larvae were only found on sugar beet which is the favourite food-plant, and on lamb's quarters (*Chenopodium album*).

There are three generations of *Mamestra trifolii* in the Arkansas Valley each year. The first moths are to be found during the latter half of May. These deposit eggs from which a generation develops during the first part of July. Eggs deposited by the July generation produce moths during the latter part of August and in early September. The larvae of the third generation mature in late autumn, and the pupae live through the winter in cells in the soil. Adults develop from these pupae during the latter half of May of the following year.

The ploughing out of the beets at harvest time breaks open many of the pupal cells and is an efficient check. Cold weather is also instrumental in killing the pupae. At Rocky Ford, Colorado, the following parasitic and predaceous enemies of the striped beet caterpillar have been recorded: *Microdus inedius*, Cress., *Meteorus* sp., *Phorocera claripennis*, Macq., *Perilloides bioculata*, F., and the spider *Phidippus coloradensis*, Thorell.

The striped beet caterpillar is easily killed by arsenicals and is therefore quickly controlled by a spray (75 to 100 gals. per acre) consisting of 3 lb. of Paris green and 6 lb. of whale-oil soap in 100 gals. of water.

McGregor (E. A.). **The Red Spider on Cotton.**—*U.S. Bureau of Entomology*, Circular no. 172, 17th May 1913, 22 pp., 12 figs., 4 tables.

With the exception of an outbreak in Louisiana in 1893, a severe occurrence of the 'red spider' (*Tetranychus bimaculatus*, Harvey) on cotton had not been recorded till the 1903 outbreak in South Carolina and Georgia. In the following years the pest was also reported from North Carolina and Alabama. Its presence is now established from Maine to Florida and westward to California and Hawaii. With the exception of Western Colorado and parts of California no serious complaints have been received other than from the south-eastern portion of the cotton belt.

The 'red spider' colonies live on the underside of the cotton leaves, and their constant feeding causes blood-red spots to appear on the tops of the leaves. The effect upon the cotton plant is that the leaves drop one by one, until usually the plant dies. The female mite lays about 50 to 60 eggs which, in the summer, hatch in about four days. The newly hatched mite moults in two days, and two days are also required for each of the two nymphal stages. Mating takes place immediately after the emergence of the adult and the life-cycle is completed soon after. In South Carolina there are probably 16 or 17 generations in an average year. A severe winter favours the increase of the mite by destroying its natural enemies, while mild weather favours the latter. Of these a Cecidomyid fly, *Arthrocnodax* sp., and the Anthocorid bug, *Triphleps insidiosus*, are the most important. Further enemies of the 'red spider' in cotton-fields are *Chrysopa quadripunctata*, *Euthrips fuscus*, *E. occidentalis*, *Scolothrips sexmaculatus*, *Coccinella 9-notata*, *Hippodamia convergens*, and *Stethorus (Scymnus) punctum*.

The most effective preventive measures against the pest are clean cultivation, especially weed destruction, and a trap crop of cotton round the boundary of a field. Most cases of infestation in urban localities have their origin in borders of cultivated violet. The latter should either be repeatedly sprayed or entirely destroyed. Care should be exercised in selecting relatively immune varieties of cotton. Since 'red spider' also infests many other cultivated plants, rotation is useless.

Regarding remedial measures the pulling up and burning of the first few plants which show infestation is in some cases extremely effective in eradicating the pest. Once the latter has been established it is most difficult to wipe out. Effective sprays used during the 1911 season are, solutions in 100 gals. of water of (1) 3 lb. potassium sulphide (\$0.75); (2) 15 lb. flowers of sulphur, 20 lb. fresh lime (\$1.40); (3) 5 gals. miscible oil (\$5.00); (4) 16·5 lb. potassium permanganate (\$8.25); (5) 2·5 gals. miscible oil, 26 oz. Blackley tobacco extract (40 per cent. nicotin sulphate), (\$1.50); (6) 28 lb. flowers of sulphur, 14 oz. soft soap (\$1.47). The flour paste spray recommended by W. B. Parker [see this *Review*, Ser. A., i, p. 240] was also used with success. A contact insecticide is absolutely necessary, and it must be applied so as to hit the entire underside of every leaf of an infested plant. A

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second application should be made a week after the first in order to kill the individuals that were not hatched at the time of the first spraying.

Mendes (C.). **Apparecimento da** *Icerya purchasi* **e** *Novius cardinalis* **em S. Fiel.** [Appearance of *Icerya purchasi* and *Novius cardinalis* in Portugal.]—*Broteria, Salamanca*, x, pt. 2, Ser. Zool., June 1913, p. 146.

In the early summer of 1910 it was observed that the trunks and branches of *Acacia melanoxylon* on the farm belonging to the College of S. Fiel (Beira Baixa) were more or less covered with *Icerya purchasi*. The insect had never been observed before on this site nor had it been found on the orange trees in the vicinity. The Acacias were completely covered in a short time, but a little later it was observed that the scale was being attacked and cleared off by a coleopterous larva which ultimately completely cleared the trees. This larva was identified as that of *Novius cardinalis* by M. N. Martin, who also discovered that *I. purchasi* had invaded orange groves at Castello Bramo, 12 miles away, and was known there as a pest. The affected oranges there had been thrown on to the dunghills and the insect was detected on Acacias soon afterwards. The noteworthy fact is the sudden and unexpected appearance of *N. cardinalis* on the spot and the clearance of the trees within the year. The author strongly urges the artificial cultivation of the Coccinellid as a beneficial insect.

Witt (D. O.). **Notes on the Life-History of** *Cyrtotrachelus longipes*.—*Indian Forester*, xxxix, June 1913, pp. 265-272, 1 pl.

The Curculionid, *Cyrtotrachelus longipes*, previously recorded from *Melocanna bambusoides*, attacked a plantation of *Dendrocalamus strictus* in the Gharakota Reserve of the Saugor Forest Division in the Central Provinces. The beetles appear about July or August, depending on the state of the monsoon. It is noteworthy that the appearance of the beetle coincides with the sprouting of the new bamboo shoots on which the eggs are laid. The eggs are not necessarily deposited just above an internode as stated by E. P. Stebbing, the author having found them at practically any part of an internode. The eggs, from 2 to 4 of which are laid by one female on the same day, hatch out in from three to five days. The larva on hatching out does not at first bore horizontally through to the centre of the shoot as imagined by Stebbing, but rather in a slanting direction inwards, and it does not reach near the centre of the shoot until it is at least half-grown. With the exception of those instances in which the point of attack is very close to the ground, the larva never reaches the base of the shoot. In September the larva drops to the ground and there buries itself for pupation in a smooth oblong cell, no bamboo fibres being used in its composition. In this cell the pupa remains until the following July or August, when it emerges.

The method of digging up and burning the pupal cases as suggested by Stebbing is not satisfactory, owing to the depth which the larvae burrow and the difficulty of finding the pupae. The best method of dealing with the pest is to collect the sluggish adult beetle by hand and burn infested culms, as is done with considerable success in the Gharakota Reserve.

DAMMERMAN (K. W.). **De Hevea-termiet op Java.** [The Hevea termite in Java.]—*Mededeelingen van de Afdeeling voor Plantenziekten*, no. 3. *Dept. van Landbouw, Nijverheid en Handel, Buitenzorg*, 1913, 12 pp., 2 figs., 2 pl.

Until a few years ago it was thought that the termite *Coptotermes gestroi*, Wasm., did not occur in Java, but in 1911 and 1912 the Department of Agriculture in Batavia received a number of *Hevea* and *Ficus* trees which had been killed owing to the attacks of a termite which Dr. Holmgren referred to that species. It was subsequently found that this pest was known to the natives, in Western Java at least, as 'rinjoeh atangas.' *C. gestroi* is known in Malacca, Sumatra and Borneo, and there is reason to believe that it is indigenous to Java.

The plants attacked by this species are:

| | |
|---|---|
| *Afzelia palembanica.* | *Eriodendron anfractuosum.* |
| *Albizzia procera.* | *Ficus elastica.* |
| *Araucaria* spp. | *Hevea brasiliensis.* |
| *Artocarpus blumei.* | *Kumpassia malaccensis.* |
| *Bombax malabaricum.* | *Mangifera odorata.* |
| *Canarium commune.* | *Ochanostachys amentacea.* |
| *Cocos nucifera.* | *Oncosperma filamentosum.* |
| *Dacrydium* sp. | *Oroxylon indicum.* |
| *Dammara orientalis.* | *Shorea* spp. |
| *Dyera* spp. | |

The best method of dealing with the pest is to burn any infested trunks of *Hevea* or *Ficus* and clear the stumps with dynamite. Special attention must be paid to the presence of fungi, since *Coptotermes* cultivates the latter. The destruction of the termite's nest is not always practicable, besides it by no means ensures the destruction of the entire colony. The fumigation of the nests with sulphur and arsenic, applied with a special fumigation pump, such as the 'Universal Ant Destroyer,' is very effective and has the advantage of simplicity and cheapness. The nozzle of the pump should also be inserted into holes bored near the foot of infested rubber trees and the holes stopped with a tarred wooden plug. If the infested area and the number of hollow trees are small, it is useful to work the soil deeply in order to destroy the passages of *Coptotermes*, remembering that the latter are deeper in dry ground and nearer the surface in low-lying and damp ground. While the soil is being turned over a mixture of sawdust and Paris green (100 : 1) should be laid round the trees in a ring. A strict watch, however, must be kept for some time on the area so treated, since the termites hide themselves very efficiently and multiply with rapidity. It is

advisable not to use the wood of *Hevea* or other food-trees of *Coptotermes* in the construction of bridges, etc., and such outside woodwork should be thoroughly tarred.

WEYRICH (J.). **Bekampfung des Heuwurmes im Jahre 1913.** [The campaign against the first generation of *Clysia ambiguella* in 1913.]—*Luxemburger Weinzeitung, Grevenmacher*, i, no. 24, 15th August 1913, pp. 406-409.

The author made a number of experiments to test the relative efficacy of nicotin and conchylin sprays against the first generation of *Clysia ambiguella*. Four plots of vines were sprayed (leaving a number of vines unsprayed for control purposes) with equal parts of copper sulphate, nicotin and lime (19th and 26th May), with nicotin and soft soap, with conchylin 1 : 4 (29th May) and with conchylin 1 : 5 (4th June), respectively. The first plot was examined on 14th and 18th of June, showing that 20 of the unsprayed stocks had 123 inflorescences* with 370 *Clysia*, whereas 20 sprayed ones only had 162 *Clysia* on 137 inflorescences. The experiences with the second plot are not recorded. On the third plot (25th June) 20 control stocks showed 340 *Clysia* on 102 inflorescences, whereas 96 inflorescences of the 20 sprayed stocks revealed 120 *Clysia*. The fourth plot (25th June) showed 255 *Clysia* on 90 inflorescences in the case of 20 unsprayed, and 126 on 78 inflorescences in the case of 20 sprayed stocks. The relatively unfavourable result of the last experiment is probably due to the vines having been sprayed when some of the inflorescences were already in bloom.

The spraying with nicotin required the same time as that with conchylin. One quart sufficed for about 12 to 15 stocks, which figures out at about 13 to 16 gallons of conchylin per acre. Including wages (12 days at four shillings) spraying one acre with conchylin costs between £3 15*s.* and £4, an expenditure that may be justified by results. The relative value of the two sprays against the second generation of the pest has yet to be determined.

According to the official report (1st August, 1913) the crop expectations in Luxemburg vineyards for this year are nil to 25 per cent., and in one case 50 per cent., owing to the ravages of *Clysia* and fungous diseases.

FINK (D. E.). **The Asparagus Miner and the Twelve-spotted Asparagus Beetle.**—*Agric. Expt. Station, Coll. Agric., Cornell Univ.*, Bull. 331, April 1913, pp. 411-435, 7 pls.

The authorship of the above paper, of which an abstract is given on p. 295 of this Review, Series A, was attributed in error to the Director of the Institute instead of to Mr. D. E. Fink.

* The German 'Geschein' signifies the inflorescence of a vine only until the grapes are set. Ed.

**SHCHEGOLEV (I. M.). ВРЕДНЫЯ НАСѢКОМЫЯ И БОЛѢЗНИ РАСТЕНІЙ НАБЛЮДАВШІЯСЯ ВЪ ТАВРИЧЕСКОЙ ГУБЕРНІИ ВЪ ТЕЧЕНІЕ 1912 ГОДА [Report (of the Assistant Entomologist to the Zemstvo) on injurious insects and diseases of plants in the Government of Taurida during the year 1912]. Simferopol, 1913, pp. 24–56.**

The author characterises the year under report as not being especially remarkable as regards insect pests, but they were nevertheless plentiful. The meteorological conditions of the year, while yielding abundant food to the insects by way of weak and diseased plants, at the same time affected also their life and development. Of the usual annual garden pests in the province, *Rhynchites pauxillus*, Germ., was found in great numbers early in the spring, although it suffered considerably from the cold and windy weather. *Rhynchites bacchus*, L., and *Anthonomus pomorum*, L., appeared in smaller numbers; *Hyponomeuta malinellus*, L., was abundant without doing noticeable damage. This was also the case with *Carpocapsa pomonella*, L. Amongst other pests of fruit gardens the author mentions Aphids and TORTRICIDAE, *Hoplocampa brevis*, Klug, *Psylla piri*, Foerst., *Lygus piri*, Geoffr., and *Phytoptus piri*. The insects injurious to grain and forests were more harmful, some of them swarming in certain parts of the country. *Brachycolus noxius*, Mordw., *Macrosiphum granarium*, Kirby, *Sipha* sp., and *Pentodon monodon*, F., were found in the districts of Dmitrov and Melitopol on beet, maize and onions. *Phlyctaenodes sticticalis*, L., *Lymantria dispar*, L., and *Lema melanopus*, L., appeared in great numbers, the latter on the grain fields of the district of Simferopol. *Pentaphis* has done great damage to wheat in some parts of the Government, and TENEBRIONIDAE and ELATERIDAE injured grain and bulb plants, as well as tobacco. *Haplothrips tritici*, Kurd., was found on wheat in enormous numbers; *Anisoplia austriaca*, Hbst., which was expected in great numbers, damaged only a few fields. *Cecidomyia destructor*, *Cephus pygmaeus* and *C. tabidus* were also in evidence. This latter was reported to have attacked 15-20 per cent. of the crop. There were some complaints of damage by *Pachytylus migratorius*, L., but the number of these was not great. *Caloptenus italicus*, L., invaded the district of Dneprovsk and in some districts considerable damage was done by *Epicometis hirta*, Poda.

The author also give a description of an injury to wheat and barley, which is, in his opinion, caused by a special insect, as yet not fully identified. Mokrzecki ascribes this injury to *Tarsonemus spirifex*, Marchal.

The author records his investigations on *Hoplocampa brevis* and its parasite, *Bracon rotundatus*, Szp., which were conducted at Alushta and in Aktachi, where he captured the insect in special box traps on its emergence from the soil. The first insect in Alushta was discovered on a pear tree, the buds of which were not yet opened, on the 2nd April, and the eggs are deposited in the lower part of the bud. The author then sprayed the buds with an emulsion consisting of 16 gals. water, 1 qt. soft soap, and ½ pint crude carbolic acid; this prevented the insects from

attacking further buds. The first specimen in Aktachi was noticed on 15th April. The author is of opinion that the insect winters in the earth and in the cups round the stalks. He advised that the soil should be first thoroughly pulverised and then well rammed, and where this advice has been acted upon the number of the insects diminished.

On the 30th April he visited the fields attacked by *Brachycolus noxius*, Mordw., at which time this insect was passing into the nymphal stage, whilst the first winged specimen was procured on the 5th May. The author does not approve of spraying as a remedy, but suggests dusting the young leaves of summer-sown seeds with superphosphate in powder or with basic slag, before they become tubular. He further advises reploughing the stubble to destroy the weeds, and the use of phosphatic manures. In his opinion, spraying could only be of use after the unfolding of the leaves, and then it is unnecessary as the influence of wind, rain, sun and parasites, would effect the destruction of *B. noxius*. Mention is made of one plot, previously manured with superphosphates, which, although attacked by the insect, very soon recovered. In the middle of May the author found in some fields that larvae of Coccinellids were devouring great numbers of *B. noxius*.

On the 23rd May he visited certain fields, parts of which were invaded by larvae of *Opatrum sabulosum*, L., as well as by those of an Elaterid beetle of the genus *Agriotes*. These insects were found only on one section of the field, where the soil was most friable and where there were many spots on which manure had been left and not spread, while the remaining parts of this field, as well as some neighbouring fields were free from them. The author attributes the appearance of these beetles to the favourable conditions for breeding. These lands were formerly folding places for cattle, thus accumulating large amounts of dung, and at the same time the industry of manufacturing "bricks" from animal dung, straw, etc., used for fuel and as a manure, exists there, which leads to large areas of land being covered by broken pieces of these "bricks." The beetles are usually attracted by the manure, breed there and in some years multiply to an extent injurious to the crops. The author suggests attracting the larvae of these beetles by baits of potatoes or cattle cake dug into the earth prior to the sowing of grain, and has also initiated experiments on manuring with basic slag and superphosphate.

In the same place some beetroot was found to be attacked by the caterpillars of *Agrotis segetum* and also by the above-named beetles. *A. segetum* was also found later to have damaged some wheatfields in the Government. In a garden in the same locality the author found *Lepidosaphes ulmi*, L., and *Mytilaspis pomorum*, Bouché, on the trunks and branches of apple trees, as a remedy against which he suggested rubbing the insects off with bunches of bast and spraying the trunks and branches with kerosene emulsion.

In a garden situated near Alushta, high up in the mountains, the caterpillars of *Lymantria dispar* were found, and in lesser

numbers those of *Malacosoma neustria*, L. A few days later *[illegible]cephalus striatus* was found damaging wheat and reploughing the stubble was suggested as the best remedy. In the district of Theodosia *Epilachna globosa* had done a certain amount of damage and near Eupatoria *Anoecia corni* was discovered: this insect, however, is not yet known as a pest in this province.

As a protective remedy against *Toxoptera graminum* the author recommends the deep ploughing of the stubble fields, while in case of the appearance of these insects in the spring a harrow should be drawn over the seedlings and the young shoots should be sprayed with kerosene emulsion. In June the migration of *Pentodon monodon* was observed, as a protection against which he recommended ploughing a deep furrow round fields and individual plots. In some parts the population fought this insect by collecting it by hand, but the author does not regard the method as of much real value.

The author mentions also two predaceous beetles: *Pardileus calceatus* and *Calosoma denticollis*. The former appeared in enormous quantities in the town of Simferopol and caused great annoyance to the inhabitants. The larvae of the second beetle destroy the larvae of *Phlyctaenodes sticticalis*.

## An Additional Regulation under "The Vegetation Diseases Act, 1898," Tasmania. Hobart, 11th July 1913.

In addition to the ports of Hobart, Launceston, Devonport, and Burnie, the port of Stanley shall be a place at which all plants, other than fruit and vegetables, including corms, rhizomes, bulbs, and roots lawfully imported into Tasmania, may be landed.

Mokrzecki (S. A.). ЛУГОВОЙ МОТЫЛЕКЪ ЕГО ЖИЗНЬ И МѢРЫ БОРЬБЫ СЪ НИМЪ [*Phlyctaenodes sticticalis*, L.: its life-history and methods of fighting it]. Simferopol, 1913. 34 pp.

The author begins by giving a short history of the extraordinary outbreak of this pest in the year 1901, when, especially at the end of the summer, it covered tens of thousands of acres in the Government of Taurida and also invaded other parts of Russia and Siberia. The amount of damage done in that year was calculated in millions of rubles. Last year (1912) the insect reappeared in greater numbers than in the previous years, and in the opinion of the author it is very likely that there will be a further increase this year. This Pyralid moth is found everywhere in European Russia, as well as in Siberia and Russian Turkestan. According to F. B. Paddock it has been imported into the United States, where it was first found in 1869, and did considerable damage to the beet-root crops in 1909 and 1910.

There are two broods of *P. sticticalis* in the province of Taurida, one in spring and another in summer. The first brood emerges during May, and the life of the imago is about two weeks.

The eggs are laid on the smaller grasses, generally on the lower sides of the leaves, in lines and singly, and each female lays on an average about 60-70 eggs, and even 100 according to some authors. The statement of Paddock (Jl. Econ. Entom., Dec. 1912) that in America the females lay 500-700 eggs seems to the author to be unlikely. In the province of Taurida the caterpillars of the first generation hatch out about the 23rd May, the maximum being reached about the 3rd of the month, when the migrations begin. The whole life of these caterpillars does not occupy more than 3 weeks, pupation taking place about the second and third week in June. The pupa stage lasts three weeks, and the caterpillars of the second brood appear in masses towards the end of July, starting their migrations about the middle of August, after having devoured all the plants around the place of their birth, amongst which plants the author specially mentions: *Salsola kali*, *Atriplex patulus*, *Centaurea diffusa*, *Convolvulus arvensis*, *Amarantus retroflexus*, *Setaria viridis*, and wormwood. The army of caterpillars moves in big columns and at a distance of about two inches one after the other, starting at about 9-10 o'clock in the morning and proceeding usually in a direction from east to west, or occasionally from south-west to north-east, till the evening. These armies frequently cover an area of many square miles. The caterpillars eat all sorts of plants, except certain grasses and Solanaceae, but in the absence of other food they will eat even these. They eat the leaves and bark of the young shoots of all deciduous trees, and attack even certain fir trees found in the steppes. The grasses which they do not normally touch are, *Setaria viridis*, *Triticum repens*, *T. caesium*, *Festuca ovina*, *Stipa* and some others. The author points out that it is very common for many insects not to touch plants the leaves of which contain silica, and that it has been experimentally proved that if this substance be artificially excluded these same plants will be readily eaten. By the beginning of September all the caterpillars of the second generation have passed into the earth and there hibernate as pupae.

The author's statements as to the number of generations is at variance with those of some other observers, who report three and even five generations during one summer. Vassiliev has succeeded in obtaining in the laboratory a third generation, while Paddock reports a third generation for North America. But the author points out that most of the caterpillars hatched from late-laid eggs must probably perish, as in August the grass in the steppes is all dried up. Although hundreds of caterpillars and cocoons were collected by him in August, in no case did a moth emerge from these in the same season.

The following birds are mentioned as being useful in keeping down this pest:—rooks, larks, starlings, and swallows; while the larvae are devoured by the large ground beetle, *Calosoma denticolle*, Gebl. Various undetermined parasites of the families ICHNEUMONIDAE and BRACONIDAE have been bred; and *Anthrax dissimilis*, Kurd., which pupates in single cocoons on the ends of steppe-grasses, is stated to be very effective in destroying the caterpillars.

Besides parasites, flacherie was also noticed to be prevalent among the caterpillars, and the development of these insects is also hampered by the infertility of the females of the second generation. This was noticed in 1902 and even in 1901 in some parts of North Russia, and, according to Pospelow, it is due to the great heat of the summer and lack of moisture, which delays the process of maturation of the eggs in the bodies of the imagos. This has been experimentally proved by Vassiliev.

The author mentions cases brought to his notice by veterinary surgeons of gastric troubles set up in domestic animals after eating grass on which the caterpillars had fed or were feeding.

To protect gardens and cultivated fields from invasion by the caterpillars it is recommended to dig round them a ditch about 2 feet deep, with overhanging sides and containing water. If water cannot be obtained the bottom may be covered with naphtha paste, tar, treacle, or caustic lime. Grass on the edges of the ditches should be poisoned by sprinkling it with a mixture of Paris green and lime in water (1 lb. of green, 2 lb. of lime, and about 55 gals. of water) or with "azurgin," which is more effective (about ½ oz. of green in about 2 oz. of ammonia diluted in about 5 gallons with water). The effect of azurgin is twofold, it being both a stomach and a contact poison. The use of brushwood trailers for crushing the larvae is also recommended.

In the case of market-gardens, the vegetables should be covered with earth till the caterpillars have passed. In these gardens insecticides also can be used, such as decoctions of tobacco extract with soap, carbolic emulsion or kerosene emulsion, as well as hot water (about 75° C.). The best insecticide is barium chloride in a 2 per cent. solution in water; to make the solution more sticky 1-2 lb. of treacle or ½-lb. of soda can be added. The author also recommends the protection of fields or gardens by sowing round them a belt of about 50 yards of oats or some other grain, which will keep away the larvae, as they seldom attack such forage crops. Trees can be protected by belts (cardboard hoods with tanglefoot smeared on the inside) or by winding rags soaked with kerosene or carbolic mixtures round their stems, remoistening them every two days. To prevent the emergence of the insects in the following spring the author recommends deep ploughing in the autumn or early spring of the fields on which they winter.

Mokrzecki (S. A.). ВРЕДНЫЯ НАСѢКОМЫЯ И БОЛѢЗНИ РАСТЕНІЙ НАБЛЮДАВШІЯСЯ ВЪ ТАВРИЧЕСКОЙ ГУБЕРНІИ ВЪ ТЕЧЕНІЕ 1912 ГОДА [Report (of the Chief Entomologist to the Zemstvo) on injurious insects and diseases of plants in the Government of Taurida during the year 1912]. Simferopol, 1913, pp. 1-23.

*Psylla pyri*, L., has greatly increased in the pear orchards of the valleys of Katchi and Belbeka and near Alushta, attacking the dwarf and medium-sized trees, interfering with the growth and causing the leaves and ovaries to fall off and the fruits to be misshapen. In his previous reports the author has already pointed out that in this province this insect winters in the egg stage, thus

resembling *Psylla mali*, Foerst, which, however, is totally absent there. This statement is at variance with those of other authors, such as Slingerland in America, Schreiner in Russia, and Ber[illegible] in Germany, that it winters in the imago stage. In the Crimea this insect flies during the whole winter, and at the same time the eggs may be found on the trees, together with their usual companion, the fungus *Capnodium*. The eggs have no stalk and no long thread in the form of a tail, as described by the above-named authors, and it is possible that it may be a distinct species. The successful fighting of the insect can be done preferably in the winter and in the early spring. During the winter the pear trees attacked should be sprayed with a 3 per cent. or 4 per cent. solution of iron sulphate (9-12 lb. in about 27 gallons of water); in the spring the blossoms, the buds and leaves should be sprayed with a decoction of quassia with soft soap or of tobacco extract with soft soap. Later on it is very difficult to fight the insect; after the fall of the leaves the pears ought to be repeatedly sprayed either with a 1 per cent. solution of Avenarius' carbolineum, or with a kerosene emulsion, or with quassia.

*Lymantria dispar*, L., has laid its eggs in such enormous quantities in the forests of the mountains of the Crimea that both the Central Government and the Zemstvo have ordered the author to investigate the matter specially. In his opinion, fighting the insect in the forests is very difficult and expensive, and at the same time quite unnecessary, as this is done there more successfully by parasites. Amongst the latter he mentions *Hadronotus (Telenomus) howardi*, Mokr., which usually destroys 75-80 per cent. of the eggs of *L. dispar* in the Crimea; *Apanteles fulvipes*, Hal., *A. solitarius*, Ratz., and *Pristomerus vulnerator*, Panz., which all parasitise the young caterpillars; while when adult they are attacked by *Sarcophaga affinis*, Fall., *Roeselia antiqua*, Mg., and *Scotia saturniae*, R. D. The question bears a different aspect in gardens or parks, where the destruction of the eggs is of importance. This can be accomplished either by hand, by scraping the eggs from the bark of the trees, or by soaking the sponge-like mass of eggs with crude oil, kerosene or carbolineum. Experience in the Crimea shows the crude oil method to be the cheapest, while the hand method is the most expensive. In 1902 the soaking of the egg-masses with a mixture of kerosene and tar over an area of 549 acres (44,500 egg-masses) cost about £4 18*s*. 0*d*.; while the scraping and collecting of 248 lb. of eggs over an area of 726 acres in 1899 was done at a cost of about £24; and in 1907 the soaking of eggs over 732 acres cost £1. To prevent the caterpillars from getting on to the trees the application of tanglefoot is suggested while for the destruction of the larvae spraying with "djipsin-rublew" or with a solution of Paris green in ammonia diluted with water, is recommended.

*Phlyctaenodes sticticalis*, L., has appeared in great numbers in different parts of the Government and has done considerable damage to the grasses in the steppes and to the vegetables in the "bashtans" (melon and cucumber gardens). The author mentions two parasites of this insect, *Apanteles vanessae*, Reinh., and *Anthrolytus dissimilis*, Kurd.

*Carpocapsa pomonella*, L., appeared in small numbers during 1912 owing to the destruction of the apple and pear blossom by frosts. The caterpillars were observed to be attacked by an unknown fungus disease. Besides spraying, wrapping the trunks of the small and middle-sized trees with sacking and the use of bandbelts against the caterpillars of the second generation are also recommended. With regard to the practical value of the experiments on the artificial breeding of the egg parasite, *Trichogramma* [sic] *semblidis*, Aur. (*Pentarthron carpocapsae*, Ashm.), the author prefers to leave the matter an open question and cautions growers against exaggerated expectations. He mentions the practical failure of these experiments in America, as well as the similar experiments undertaken by Lounsbury to acclimatise the American parasite *Trichogramma pretiosa* in South Africa, as well as *Calliephialtes messor*, *Pimpla heliophila* and *Hymenoepimecis pomonella*. The recorded satisfactory results of the transportation of some parasites from Astrachan to Turkestan, according to the author, has aroused many questions and doubts on the part of entomologists.

*Polychrosis ampelophaga* has done considerable damage to vineyards in some districts of Theodosia, Novorossisk and Anapa on the Black Sea. Although very injurious, the biology of the insect has been very little studied. In the Crimea there is only one generation yearly, although other authors speak of two or even three. The caterpillars appear after wintering at the end of March or at the beginning of April and eat half-way into the buds, feeding later on the leaves. At the end of May they are full-grown and get underneath the bark of the vine branches where they pupate, the imago emerging at the beginning of June. Fresh caterpillars appear in July which feed very little and soon hibernate underneath the bark, etc. The author has obtained two parasites from the caterpillars: *Exorista grandis*, Zett., and *Pteromalus* sp. The remedies against this insect are, (1) the cleaning of the old bark from the vine stocks, (2) pruning by Desemery's method, (3) the smearing of tanglefoot on the branches in the spring, and (4) different insecticides. While the caterpillars are still young a decoction of quassia and soap, or of tobacco extract with soap can be used. When the leaves appear they should be sprayed with a 3 per cent. solution of barium chloride.

*Chionaspis euonymi*, Comst., appeared last summer on *Euonymus japonicus*, L., in Yalta and was also observed by the author in the previous autumn on the same plant in the Botanical Garden of Tiflis. The specimens procured in Yalta produced a parasite of the genus *Aspidiotiphagus*, which genus has not thus far been known to exist in Europe, only one species being found in California. Among useful remedies the author suggests the smearing of the stems with carbolineum during the winter, and spraying in the spring with an emulsion of crude linseed oil (1 lb. of soap dissolved in about 20 gallons of water to which are added 13½ pints of the oil). This mixture is also effective against *Lepidosaphes ulmi* and *Diaspis fallax*, Horv.

*Euthrips pyri*, Daniel, was found in March 1912 on some pear trees in Alushta, the identification having been confirmed later

by specimens received through Howard from America. The insect was also found in the year 1909 on some pear buds in the district of Theodosia. Up till now it has not done any noticeable damage in the Crimea, although very harmful in California and more recently in New York.

Amongst the insects injurious to cereals, the author mentions *Brachycolus noxius*, Mordw., as having done considerable damage in the district of Eupatoria. The injury was noticed at the beginning of April and an examination of the diseased plants showed that single stem-mothers of this aphis appeared in the tube of the middle leaf, where they were sometimes accompanied by colonies of young. The middle leaves and lateral offsets of the infested plants turned purple and the crops ceased growing and tillering. The early winter seedlings last August and September were the most damaged, while those appearing this spring (1913) were practically uninfested. The insects even attacked plants specially manured with basic slag. Besides *B. noxius*, stem-mothers of *Macrosiphum cerealis*, Kalt., were also found on the leaves of wheat. As far back as 1900 the author found some parasites of this insect, to which he now adds *Diaretus obsoletus*, Kurd.

*Oscinis frit*, L., was found in small numbers in some districts of the Government on fallen barley and oats. The flying of this insect, as well as of *Cecidomyia destructor* ceases on the 10th September, so that the seeds sown after the middle of September are not infested by it. In 1909 a parasite, identified by Kurdjumov as *Polyscytus oscinidis*, Kurd., sp. n., was obtained from pupae of *O. frit*.

Nikitin (I. V.). Плодожорка по даннымъ; Полтавской сельско-хозяйственной опытной станции [*Carpocapsa pomonella*, L.; results of investigations by the Experiment Station of Poltava]. Reports of the Agric. Expt. Sta. of Poltava, branch of Agric. Entom., no. 16, v, Poltava 1913, 73 pp. (With a preface by N. B. Kurdjumov.)

This is a report on experiments on spraying trees by means of the "driving spray method" as recommended by Ball in America. In a preface N. V. Kurdjumov gives a review of this method and of the experiments and results obtained by Ball, Melander, Quaintance and others. A bibliography of the method is appended to the preface.

The first part of the report is devoted to the biology of *Laspeyresia* (*Carpocapsa*) *pomonella* in the Government of Poltava. The insects winter there as caterpillars inside cocoons of fine silk, which are usually constructed in dry situations, as in wet places the larvae are likely to be infected by a fungus. Of 100 such caterpillars examined in 1911 it was found that 52 per cent. were healthy, 13 per cent. dead owing to parasites, 10 per cent. dead from fungus disease and 25 per cent. dead from unknown causes. The observations for the year 1912 have yielded slightly different figures. There were 67·09 per cent. of healthy

caterpillars, 14·40 per cent. were dead from unknown causes, 0·17 per cent. were parasitised, 11·31 per cent. were dead from fungus attack, and 1·03 per cent. were killed by the larvae of a predaceous beetle, *Malachius bipustulatus*. The averages for the two years show that about 60 per cent. of caterpillars survive the winter in a healthy condition, out of which however a considerable number, about 20 per cent. of the whole of the wintering caterpillars, either do not pupate or, if they do, produce no imagos, so that only 40 per cent. of the wintering insects emerge in the spring. Pupation begins early in May and continues till the beginning of July; in the insectarium the pupal stage lasts from 12 to 34 days. The eggs are laid during the early period of the season on leaves, but after the apples have developed most of the eggs are laid on them. They are usually laid singly and no particular spot on the leaves or fruits is selected. The caterpillars of the first generation are found inside the fruits after the middle of June and their numbers increase steadily up to the middle of July. They remain inside the fruits about a month and start leaving the latter about the second week of July. The pupation of the first generation takes place during the second half of July. Only about 10 per cent. of the caterpillars of the first generation pupate and produce perfect insects, the remainder winter and pupate only in the next spring. About 8 per cent. perish from parasites and different diseases. The above figures are the averages obtained during both years from observations on the caterpillars found in bait belts and on those in the insectarium. The imagos of the first generation begin flying early in August and are numerous during the second half of the month. The caterpillars of the second generation may be found after the middle of August and in great numbers in the early days of September. Owing to their late appearance not all of them are able to accomplish their development, only those which appear about the middle of the month being able to leave the fruit in the middle of September and to make a cocoon in which to pass the winter.

Two tables are appended to this chapter of the report showing diagrammatically the results of experiments in spraying different parts of fruit gardens by various methods in relation to the absolute and relative percentage of apples damaged by the caterpillars of either generation. The diagrams go to show that on the whole the first generation damages a smaller amount of fruit, while the second generation does less substantial damage, as these caterpillars often make only a small passage underneath the skin of the apple and leave it afterwards, the apples being able to recover.

The figure given above as to the number of caterpillars perishing from parasites relates to the wintering caterpillars, but investigations during the summer on caterpillars found in fallen fruit and under the belt baits showed that the number parasitised is also small. During the years under report there have been found the following parasites of *L. pomonella*.

(1) *Ephialtes* sp., an ecto-parasite of the larvae; only two specimens were obtained.

(2) *Pimpla sagax*, Htg.; a single specimen.

(3) *Dioctes exareolatus*, Ratz. (evidently the same as *Campoplex pomorum*, Ratz.), an internal parasite living on the small caterpillars (4-7 mm.); its cocoons are found usually in the calices of the fruits, where the caterpillars pass the early part of their life. In 1911, 7 or 8 specimens of this parasite were obtained at the end of June; in 1911 it was not obtained, although a single empty cocoon of it was found.

(4) *Bracon* sp.; a single specimen.

(5) *Pristomerus schreineri*, Ashm.; an internal parasite of the wintering caterpillars; two examples were bred.

(6) *Pentarthron (Trichogramma) fasciatum*, Perkins (identified by A. A. Girault, probably synonymous with *Encyrtus embryophagus*, Hartig); in 1911 two specimens were obtained from the egg of *L. pomonella;* in 1912 one was hatched out of an egg of another Tortricid.

(7) *Phygadeuon* sp., an ecto-parasite of the caterpillars; two specimens were obtained. The biology of this parasite is fully described. It attacks only caterpillars in their cocoons, and the oviposition occupies a long time (1-1½ hours), as the parasite first paralyses the caterpillar by piercing it with its ovipositor. By supplying it with disabled caterpillars one parasite was observed to lay as many as 10 eggs in one day, and after it had laid 18 eggs its ovipositor was bitten away by a caterpillar.

(8) A Tachinid fly, as yet unidentified, was the most frequent parasite found, infesting about 3-4 per cent. of the caterpillars.

(9) Two larvae of Syrphid flies were also found on the 20th August on dead caterpillars inside some apples; the larvae lived for 2 to 3 weeks afterwards, but no flies were obtained.

As stated above, the caterpillars are also destroyed by *Malachius bipustulatus*, the larvae of which beetle, often found underneath the bark of trees, penetrate inside the cocoons and attack them. The biology of this beetle has not yet been studied.

A "small speckled woodpecker" was observed in a garden on the 30th August in the act of devouring the caterpillars, whose cocoons it extracted from underneath the bark of an old pear tree.

The second part of the pamphlet contains a report of spraying experiments conducted during both years; in the report as well as in a special appendix, there are numerous tables and diagrams giving detailed information as to the number of caterpillars found, the number and percentage of injured apples, the amount of financial damage, the percentage of fallen fruits, etc., for different parts of the gardens, for certain individual trees and for different weeks of the season. The tables also contain figures as to the number of apples injured through the calyx and directly through the fruit, and the cost of spraying is also given in some cases. A garden was divided into three parts: one part was left unsprayed; the second part was sprayed by the ordinary method (from below, with the Vermorel nozzle, giving a revolving spray; a Seneka nozzle was used for spraying the crowns of the trees); and the third part was sprayed by the "driving spray" method by means of the "Pomona" and "Monarch" apparatus. The insecticide used for the ordinary spraying was Paris green in the proportion of 1 lb. of green in

. a 110 gallons of water, to which was added a corresponding ..nt of freshly slacked lime. The driving spray method aims ..etting the poison into the calyx cup, so that after the closing . the sepals it should remain there and poison the young cater- ..ars visiting the calyx and there taking their first food. In ..der to be effective and to get the poison into the calyx the ..aying must be done immediately after the petals have fallen. .. . done under high pressure and not from below, but from a ..cially built ladder, the pressure used being 10 or more atmos- ..res. As an insecticide for this method Paris green was again ..ed, but without any lime and in a solution of half the above ..ength; the Seneka nozzle was employed. In 1912 the spraying .. done under slightly different conditions, the garden being ..ided into 8 parts, one part being again left unsprayed, one ..t being sprayed with Djipsin (1 lb. to 110 gallons of water) . means of the driving spray method, and the remaining 6 ..ts were sprayed by one or other method, as in the previous ..ar, except that in one instance the insecticide used was Paris ..een (1 lb. in 110 gallons of water) without lime, but with ..mmonia (under high pressure by the driving spray method).

The result of the experiments of both years can be summarised . follows: The best results were obtained from spraying by .. ordinary method, repeated 5 times; the first generation of ..erpillars did less injury in those parts of the garden which ..re sprayed by the driving spray method, while against the ..terpillars of the second generation the ordinary method repeated . times appears to have proved to be the best remedy. The ..erage figures for both years are: on the unsprayed parts, ..jured apples 28·81 per cent.; on the part sprayed by the ordinary ..thod 4·76 per cent.; on the part sprayed by the driving spray ..thod 7·98 per cent. The part sprayed with Paris green with ..mmonia gave 3·54 per cent. of wormy apples, and the part sprayed ..th Djipsin only 3·10 per cent. These results are not so good . those obtained in America, where stronger solutions of the ..secticide were used. Ball recommends the use of 2 to 5 lb. of Djipsin in about 80 gallons of water, to which recipe the report ..aws the attention of growers.

The spraying also affected *Rhynchites bacchus* and *R. aequatus*, ..hich in 1911 damaged 20·39 per cent. of the apples in the ..sprayed part; in the part sprayed by the driving spray method, ..61 per cent.; and in the part sprayed by the ordinary method . times, 6·01 per cent. The best results were obtained from Paris ..een with ammonia, when the percentage of apples injured by ..ese insects was only 2·04.

RADETSKY (A. F.). ЯБЛОННАЯ ПЛОДОЖОРКА ВЪ ТУРКЕСТАНСКОМЪ КРАѢ И БОРЬБА СЪ НЕЮ. ТУРКЕСТАНСКАЯ ЭНТОМОЛОГИЧЕСКАЯ СТАНЦІЯ [*Carpocapsa pomonella*, L., in the territory of Turkestan and the struggle against it]. Turkestan Entomological Station Reports. Tashkent, 1913, pp. 52, 5 figs., 3 diagrams.

The author states that *Laspeyresia (Carpocapsa) pomonella* is the most serious enemy of fruit in Russian Turkestan and that all

the other fruit pests found there do not cause as much as a quarter of the injury for which it is responsible. The greatest amount of injury is done to apples and, after these, to pears. In Turkestan the variety of apples known as "Belle fleur" and "Kalvil" suffer the most, while "Selenka Vuda" is the least affected. plums, cherries, peaches, apricots, quinces, haws, walnuts, chestnuts, etc., are also exposed to attack by this insect, but the percentage of injured fruits is very small. The author has bred caterpillars in captivity on apple seeds only, and is satisfied that they can feed exclusively on leaves, thus keeping alive till the next year.

The very small number of parasites of *L. pomonella* found in Turkestan tends to support the view that it has been only recently imported into that area without its natural enemies, and that it lives there under conditions similar to those in America. The investigations of I. V. Vassiliev during the years 1909 and 1910 proved the total absence of parasites of the eggs, caterpillars or pupae of this insect, which then appeared in enormous numbers. In 1911 the author found in gardens near Tashkent two species of parasite, although only about 2 per cent. of the caterpillars was infested by them. In 1912 one of these parasites, *Ascogaster confrons*, Wesm., was found to be infesting 15 per cent. of the caterpillars of *L. pomonella*, appearing chiefly in the gardens near Tashkent, while its numbers diminished gradually in proportion to the distance from the town, and it was completely absent in remote districts. This is in accordance with the view expressed by the author in a previous work, that the parasite also has been only recently imported into the country and is gradually spreading.

The journeys undertaken by the author during the summer of 1912 led him to change his views on the subject of the importation of *L. pomonella*. He visited some remote villages in the province of Samarkand which have never previously been visited by Europeans, and which have no communications with the towns. the natives cultivate certain local varieties of apple and these were found to be infected by *L. pomonella*. The natives stated that even 50 years ago their apples were "wormy." The author is not prepared to attach too much importance to these statements, and says that allowance must be made for the possibility of the damage to the fruit being due to *Grapholitha funebrana*, Tr., which undoubtedly belongs to the local fauna and attacks some sorts of apples. At the same time, the author found specimens of *L. pomonella* in the mountain parts of the provinces of Samarkand and Fergan on wild apple trees. These parts are seldom visited even by the natives, so that there can be no question of the importation of the insect from centres of European cultivation. He also found this insect in the celebrated gardens of Isfara, on peaches.

In all these instances the percentage of infected fruits was very small, in comparison with the damage done by the insect in cultivated gardens. From the caterpillars collected by the author in the native districts, which pupated in captivity he obtained a parasite of the genus *Pimpla*, which is not found near the large

new Russian towns of the country. All this leads the author to conclude that *L. pomonella* belongs to the local fauna and existed in the country even before the Russian conquest. But this conclusion does not affect the theory of its being also imported with cultivated apples by the Russians, which probably holds good for the orchards of the large towns. The orchards near the centres of the towns are swarming with the insects, while their numbers decrease towards the periphery. In the province of Syr-Darya the pest is found in enormous quantities in the large garden district near Tashkent, while in all other parts of the province, though found in all cultivated Russian orchards, its numbers are smaller. It is also found everywhere in the gardens of the province of Samarkand, again in greater numbers near to Samarkand itself and in the province of Fergan. In the Transcaspian province it appears in smaller numbers, as, owing to the absence of water, the cultivation of apples is not much developed.

With regard to Bokhara, M. Siazoff reported that he found this insect on the northern slopes of Kara-Taga, while it is totally absent from the gardens of the new Russian town of Termesa on the frontier of Afghanistan. The percentages of the apple crops damaged by the codling moth in Turkestan for the year 1911-1912 were:—for the province of Syr-Darya, about 85 per cent.; for the province of Samarkand, 80 per cent.; and for the province of Fergan, 75 per cent. For other parts of Russia the figures are:—15 per cent. for St. Petersburg; 30-35 per cent. for the Government of Tambow; 50 per cent. for the province of the Don; 30-50 per cent. for the Government of Saratow; 30-60 per cent., according to both Mokrzecki and Portchinsky, for the Crimea; 85-95 per cent. for the Government of Astrachan. These figures are only approximate.

In the northern provinces of Russia, there is only one brood of *L. pomonella* in the year; in middle and south Russia, two more or less complete broods; while in Russian Turkestan there are three—two complete and one more or less partial, though considerable. In this region *L. pomonella* winters in the caterpillar stage, pupating in March and April, and the first imagos appear towards the end of the latter month. Oviposition starts at the beginning of May in the province of Samarkand and in the middle of May in and near Tashkent, reaching its height between 28th May and 7th June, and the first caterpillars appear at the end of May. There are very few moths in the middle of June, but from about the 24th June they increase again, reaching the maximum in the first week of July, and during the whole of July their number is enormous. The caterpillars of the second generation appear in the fruits during July and August; about half of them pupate and produce moths of the third brood, while the other half hibernate and pupate only in the next spring.

The author has experimented on the time the moths can live without food in captivity, and found the average period to be eight days, while single specimens lived much longer; 18, 20, 24 and 25 days. Moths kept warm during the winter showed remarkable longevity; one female lived 43 days, another 46, while the males lived for about 25 days.

Throughout May the average number of eggs laid by a single female is 75; in June and in July it is about 100: while in August it is much less. The author reports having obtained from single specimens exceptional quantities of eggs; thus in June 1911, one female laid 149 eggs, and in July 1912, some others laid 150 to 160, and one even 171 eggs.

With regard to the place of oviposition the statements of the Russian and American authors are at variance; for while in America the vast majority of the eggs are laid on leaves, in Russia they are found mostly on the fruit. In Turkestan oviposition takes place exclusively on the fruit; during two years of continuous observations the author found an egg on a leaf on two occasions only.

The author further describes in detail the life of the caterpillars from the date of hatching to pupation. He noted that about 75 per cent. of them pupate on the stem of the tree, while the remainder pupate either on the branches or inside the fruit. In the last chapter the factors which facilitate the dispersal of the codling moth are discussed.

ANDREWS (E. A.). **Entomologist's Notes.**—*Quarterly Jl., Sci. Dept., Indian Tea Assoc., Calcutta*, pt. 1, 1913, pp. 28-29.

Whilst investigating the "mosquito blight" in one of the districts of Cachar, the author was able to find *Helopeltis theivora* in all stages upon tea, not only upon that which had been lightly pruned, but amongst that also which had been collar-pruned, thus confirming Mr. Antram's statement that the insect lives upon the tea during the cold weather. The female bug appears to lay her eggs, as a rule, in the axils of the new buds and in the tiny shoots springing from the bottom of the bush. Thus the benefit of cleaning out the bushes for mosquito blight would appear to lie rather in the removal of shade than of eggs, although many young bugs are taken away with the prunings.

An interesting Mermithid parasite was discovered in Cachar. Its eggs are laid in the ground, and larvae emerge which bore into the body of the host. The larvae eventually leave the latter and pupate in damp soil. Little is as yet known of this parasite, but immature stages of apparently the same species were recorded from the Darjeeling district in 1904, and identified by Prof. Camerano as Mermithids. Since then it has been recorded from Sylhet.

GLASENAPP (S.). ОПЫТЫ ОПРЫСКИВАНІЯ ЦВѢТУЩИХЪ ЯБЛОНЕЙ ТАБАЧНЫМЪ ОТВАРОМЪ [Spraying apple trees in blossom with tobacco extract].—ТРУДЫ БЮРО ПО ПРИКЛАДНОЙ БОТАНИКѢ [Memoirs of the Bureau of Applied Botany]. St. Petersburg, vi, no. 4, April 1913, pp. 243-250. (With German summary.)

The author made experiments in his orchards in the Luga district of the St. Petersburg Government, in order to test whether it is practicable to spray apple trees when in bloom without

damaging the fruit prospects. The trees selected (1911) had suffered from the ravages of *Psylla mali* and did not show very many blossoms. They were sprayed twice in one day with an extract of tobacco prepared by boiling 1 lb. of *Nicotiana rustica* for a quarter of an hour in 3 gallons of water, and then diluting with 6 gallons of water. The decoction was strained through a fine sieve and the trees and blossoms were sprayed with a Pomona spraying outfit. If it be assumed that *N. rustica* is of equal strength with *N. tabacum*, the author's extract was somewhat weaker (5 : 9) than that employed by U. Pickering and F. V. Theobald (1908). At the time of spraying, the blossoms were full-blown, and therefore all the *Psylla* were hatched. The double treatment was sufficient to destroy all the insects, or at least they could not be found after spraying. The apple crop was small and some of the fruit had an irregular shape, which was probably due to the *Psylla* damaging the flower-pedicels before spraying.

In 1912 the author repeated the experiments on a larger scale. Two sets each of 5 apple trees of the Antonovka variety, having a good show of blossom, were sprayed twice; the first time when the flower-buds were still unfolded, the second time when in full bloom. One set was sprayed with tobacco extract of the same strength as in the preceding year; the other set with an extract three times as concentrated (1 lb. of *N. rustica* in 3 gallons of water). In another orchard the author sprayed 50 trees in full bloom. In all cases the sprayed trees produced a fine crop of apples of good quality, whereas the unsprayed ones showed much stunted fruit owing to *Psylla* attack. The author is thus able to confirm Theobald's and Pickering's conclusions; further, the spraying did not interfere with the bees. The weak tobacco extract spray was quite sufficient to destroy *Psylla mali*, young caterpillars of *Cheimatobia brumata*, TORTRICIDAE and similar pests.

ESCHERICH (K.) & BAER (W.). **Tharandter Zoologische Miszellen.** [Zoological notes from Tharandt.]—*Naturw. Zeits. für Forst- und Landwirtschaft*, xi, no. 2, Feb. 1913, pp. 98-128, 5 figs., 1 pl.

*Pachynematus montanus*, Zadd.—Since 1908 pine trees in western Saxony have been increasingly damaged by this sawfly, the injury resembling somewhat the ravages made by *Nematus abietum*. There are, however, essential differences in the methods of attack, *N. abietum* feeding on the upper shoots of the current year, whereas the damage done by the new pine pest is restricted to the shoots of the preceding year and is yet more conspicuous on twigs three or four years old. The actual damage to the needles also differs according to the species. Whereas the larva of *N. abietum* starts its attack at the edge of the pine-needle and spares the harder parts, so that the point of the needle has the appearance of being suspended by a thread, the larva of *P. montanus* attacks the flat side of the needle, finally leaving the latter as a thin, transparent membrane. This method of feeding

may explain how it is that the latter species does not attack the young thick square needles. Owing to the absence of chlorophyll in the needles after they have been attacked the trees at first have a pale appearance, resembling the symptoms caused by *Tortrix (Asthenia) pygmaeana*. Later, when the remains of the needles are dried up, the injured trees assume an intense reddish colour, as do those attacked by *N. abietum*.

*P. montanus* emerges during May; females captured on 24th May oviposited 3 days after, and the larvae hatched between 7th and 9th of June. The laboratory records synchronised with the field records. At the end of June the larvae attain full size, and the majority spin their cocoons in the ground during the beginning of July, remaining there until the following year.

The damage was particularly severe in 'stands' of 40 to 70 year old trees in the forest ranges of Tharandt, Wendischcarsdorf, Werdau and Waldheim. It was found that bands of tanglefoot placed round the trees against the nun moth were occasionally completely covered with *P. montanus*, and that it was therefore advisable to make the bands considerably broader.

*Lophyrus hercyniae*, Htg.—The author knows of only one previous record of damage done to pine trees by this insect, namely a not very serious infestation of hedges along a railway line near München. Lately, a severe but localised attack in the State forest range of Untertriebel (Saxony) would have assumed alarming proportions had it not been controlled by the energetic measures taken by the authorities. In 1908, the first serious infestation occurred, and about 70,000 larvae were collected between the 6th and 20th October and destroyed. In July 1909, numerous cocoons were also found, and from 2nd August till 4th September 8,740 larvae and 57,800 cocoons were collected. In the first fortnight of October only a few larvae and about 700 cocoons could be found in the infested area (5 acres).

Only a single egg is deposited in each pine-needle. Contrary to a frequently made assertion that sawfly eggs only develop in living plants, the authors were able to breed out larvae from twigs taken to the laboratory. The older larvae of *L. hercyniae* attack the pine-needles by eating them to their base without leaving any remains, as is so characteristic of other species. The cocoons are to a large extent fixed to the pine-needles on the twigs, and are thus liable to be destroyed by birds. During the winter, cocoons of this species were found among the stomach contents of *Parus cristatus* and *Regulus regulus*.

Usually *L. hercyniae* has two generations in one year. The adults emerge in April and sometimes are on the wing until the beginning of June. The chief season for damage to pine trees is June and the beginning of July. The second generation appears after a very short period of pupation, depending largely on climatic conditions; but frequently the two generations overlap or the second may be partly suppressed.

*Hepialus humuli*, L.—An addition to the large food list of this insect, previously known as a hop pest, is the hickory tree (*Carya alba*). At Hubertusburg, in 1912, hickory roots were

found to have been tunnelled by the caterpillars, the thinner ends of the roots frequently being completely excavated. So far, the damage has not been very serious, in one nursery only 2 per cent. of the young hickory trees being infested without noticeable ill-effects. The softness of the roots explains why the hickory tree has become a food-plant of an insect usually favouring herbaceous plants.

*Ergates faber*, L.—In Prinkenau lamp-poles and fence-posts of pine wood, some even painted with carbolineum, were found to be infested with the larvae, pupae and imagines of this Longicorn. It was seen from a sample of damaged wood that the peripheral parts had been spared whereas the sapwood had been tunnelled through and through, the heartwood again being left untouched.

*Palaeococcus fuscipennis* (Brm.).—In 1911 this reddish scale occurred in large numbers in Reudnitz (Saxony) and frequently completely covered tanglefoot bands round pine trees. In these colonies larvae of a beetle were found, which in colour and general appearance closely resemble the scale. These larvae proved to be the Coccinellid, *Novius cruentatus*, which prevents the scale from becoming a very serious pest.

The author also gives an account of other insects found on tanglefoot bands.

Escherich (Prof. K.). **Fortschritte der Leimtechnik.** [Progress in the art of applying tanglefoot.]—*Tharandt. forstliches Jahrbuch*, lxiv, 1913, pp. 78-88, 4 figs.

The disastrous occurrence of the nun moth in Saxony has led to the banding of the trees with tanglefoot in more than 50,000 acres of State forests. The application of tanglefoot on so large a scale necessitated the use of special apparatus, Cyrus', Ringler's and Janke's tanglefoot squirts being employed. The latter has proved to be the best, for with this it is possible to band the tree with greater ease and at a greater distance from the ground.

A striking example of the advantage of 'high banding' was afforded by the Leipzig University forest near Oberholz, where the 'low banding' had retained its adhesive properties for more than a year. Below these bands, as well as below those 10 feet higher up the tree, dense rings of 'tents' showed that if the 'high banding' had not been resorted to countless caterpillars would have ascended to and defoliated the tree-tops. 'High banding' is by no means a more costly process than 'low banding'; 58 trees on an area of 120 square yards were banded by 4 men in 15 minutes, which equals 0·5 pfennigs per tree (4*s*. 10*d*. per 1,000 trees) for wages (30 pfennigs per hour).

Instead of banding the trees, special ropes treated with tanglefoot were coiled round the trunk by a whip-like action of the operator. A special apparatus to enable the prepared rope to be whipped round the trunk at some height from the ground proved to be unreliable for many reasons. The best method of high banding now known is for the operator to stand on a ladder and apply the tanglefoot with the squirt mentioned above.

**Ehrhorn (E. M.). Report of the Division of Entomology, Territory of Hawaii, for the Biennial Period ending 31st December 1912.** Honolulu, 1913, 120 pp.

The author considers soil attached to the roots of imported plants as specially dangerous; grubs of *Anomala orientalis* which attacks the roots of sugar-cane have been found in it, and various species of lepidopterous larvae have been found crawling over the outsides of packing cases, including larvae of *Lymantria dispar* from Japan. All fruits and vegetables found in the baggage of immigrants are destroyed and replaced by island products.

An account is given of the injurious insects and diseases intercepted upon entry into the Territory, with details as to the character of the insect and the plants and places with which it is connected. The list comprises 8 Orthoptera, 4 Heteroptera, 37 Homoptera (of which 30 were scale-insects), 1 Thrips, 23 Coleoptera, 5 Diptera, 20 Lepidoptera, 1 Hymenopteron and 27 ants.

The author states that the appearance in Oahu of *Ceratitis capitata*, the larva and pupa of which may be carried in the soil attached to plants, led to a prohibition of the export of plants and soil, as well as fruit, to the other Hawaiian islands, unless declared free from pests. He advises greater vigilance to prevent exportation of fruit in small packages by individuals.

A record kept of the fruits and vegetables attacked in Hawaii by *C. capitata* includes, strawberry guava, avocado pear, guava, sweet and sour orange, Chinese plum (*Noronhia emarginata*), ripe papayas, Chinese ink-berry (*Cestrum*), kawani seeds, prickly pear (*Opuntia tuna*), loquats (*Citrus japonica*), a species of *Eugenia*, mock orange (*Murraya exotica*), the Jamaica damson plum (*Chrysophyllum oliviforme*), peach, Chinese orange, green peppers, squash, figs, rose apple, star apple, mountain apple, coffee berries, mango, grape fruit, Natal plum (*Carissa arduina*), limes and *Carambola*. The supposed enormous propagation of the insect on the wild guava was not borne out, the average proving to be less than 1½ flies per fruit. The fly has reached all the large islands except Lanai, and in Hawaii the Hilo, Puna, and Kau districts are still immune.

The threat of the Californian authorities to refuse all shipments of fruit, and especially of bananas, from the Hawaiian Islands has led to legislation enabling the pests complained of to be dealt with. Packings of Hilo grass, which introduces the pupa of *Ceratitis capitata* and of old dried banana leaves, infested with *Hemichionaspis minor* and *Chrysomphalus aonidum*, were discarded; old stumps, dried leaves and rubbish covered with these scales and with *Pseudococcus bromeliae*, which is carried by the ant *Pheidole megacephala* from them to the young growth, were cleaned up in certain plantations and along the roads, and many old fields were even wholly uprooted and replanted.

*Gelechia gossypiella* (the Pink Cotton Boll-worm) has been greatly reduced by the application of the law laid down against the banana pests. The cotton in certain abandoned fields full

of small bolls was uprooted and the destruction of the breeding ground soon materially decreased the percentage of infested bolls in the neighbourhood.

A number of extracts from official regulations as to fruits and plant traffic are given at the end of the report.

Dr. T. **La Punaise des Blés.** [The Wheat Bug.]—*Bulletin Agricole de l'Algérie et de la Tunisie, Algiers*, xix, no. 12, 15th June 1913, pp. 257, 258, 1 fig.

*Elia germari* var. *cognata* is a bug which on the upper Algerian table-lands periodically does much damage to wheat by sucking the young ears; it was first noticed in 1886, and is locally called "umm tebagh."

*E. germari* is fairly common in Spain, the South of France, and Italy, but it does not seem to attack cereals to any extent there. The Algerian variety, too, normally lives upon wild grasses, and it is only under certain conditions that it attacks cereals. It quickly empties the young corn and lays its eggs on the ears. The young are hatched five or six days later, and immediately begin to suck the ears within their reach. The insect reaches its adult state within a month. When fully formed corn is attacked the insect deprives it of the whole of the gluten. The grain becomes thin, shrivelled, almost empty, easily broken with the nail, and not compressible by the hand, whitish and dull; it contains water, 12·80 per cent.; acidity, 0·2175; sugar, 2·83; gluten, 0 per cent. In May and June of this year the "umm tebagh" extensively invaded the Tiaret region. Its biology is not sufficiently known for it to be effectually resisted, for, like the "douda," it has been too long neglected, owing to the want of scientific organisation in the agricultural services.

**Bladluizen** [Aphides]. **Schildluizen** [Coccidae].—*Vlugblad, Nos.* 1 & 2, *Instituut voor Phytopathologie, Wageningen*, June 1913.

In these popular leaflets it is recommended to treat infested shrubs and trees with an 8-10 per cent. solution of carbolineum, especially in the case of Coniferae, applied with an atomiser.

Van Poeteren (N.). **Carbolineum als bestrijdingsmiddel tegen schadelijke dieren.** [Carbolineum, a remedy against pests.] —*Tijdschrift over Plantenziekten, Wageningen*, xviii, nos. 5 & 6, 1912, pp. 132-148; xix, no. 1, 1913, pp. 12-38.

The usefulness of carbolineum in horticulture has been previously discussed by J. Ritzema Bos (Tijds. over Pl., 1908, pp. 15-46) and by E. Molz (Centralbl. Bakter., ii, Abt., xxx, 1911, pp. 181-232), and the composition of various brands of carbolineum by S. C. J. Olivier (Chem. Weekblad, 1908, no. 6).

The results published in these papers have led Mr. van Poeteren to a detailed re-examination of the question, and his conclusions are grouped under six headings:—Against which insects is carbolineum effective; which plants may be sprayed; time of spraying; influence of carbolineum on plants; emulsified and non-emulsified carbolineum; spraying methods.

Some brands of carbolineum are very effective as insecticides and fungicides, and deciduous as well as a few evergreen woody plants do not suffer from carbolineum emulsions; these however ought not to be applied stronger than 6-10 per cent. Spraying should be undertaken at the end of winter, evergreens at the latest on 15th March, deciduous shrubs and trees two or three weeks later. The detrimental effect of carbolineum frequently noticeable in the buds after spraying, is negligeable, provided the spray be not applied too late, nor in too concentrated a solution. The advantage gained by destroying the pests is generally greater than any injury done to the plant by spraying. The spray should be applied with an atomizer.

SCHOEVERS (T. A. C.). **Eenige pogingen tot bestrijding van schadelijke insecten door middel hunner natuurlijke vijanden.** [Some attempts to control injurious insects by means of their natural enemies.] — *Tijdschrift over Plantenziekten*, xix, 1913, no. 3, pp. 91-96; no. 4, pp. 109-130.

A detailed discussion of the subject and a useful summary of the experimental work of Howard, Fiske, Froggatt, Quanjer, de Bussy, Compère and others.

**Coccids of the Laurel.**—*Jl. Soc. Nat. d'Horticulture de France*, xiv, July 1913, p. 417.

At a meeting of the Society held on 26th June 1913, M. Clement exhibited leaves of *Laurus nobilis* covered with *Lecanium lauri* and remarked that this species so closely resembled *L. hesperidum* that many authors, amongst others Signoret, did not regard it as a valid species but considered the two to be identical. He also exhibited a number of leaves of the Red Laurel attacked by *Aspidiotus nerii*. He says that both species can be destroyed by the ordinary methods used against scale-insects and that immersion gives excellent results. At the same meeting M. Pinelle reported the results of experiments made with an insecticide called "Guerbal" against the Woolly Aphis: 12 lb. of this mixed with soap and made up with 20 gallons of water was used as a spray, and a few hours afterwards it was found that all the aphids which has been touched by the liquid were dead. No burning of the leaves was observed. The treatment should be repeated two or three days later. The interest of the experiments lies in the fact that this particular insecticide does not damage young wood. No information was given as to the composition or cost of the preparation.

Sloward (F.). **The Insensitivity of the life-forms of the Potato Moth to various Poisons.**—*Australasian Assn. for the Advancement of Science, Melbourne,* 1913.

One of the most troublesome insect pests which ravage the potato crops of the Commonwealth is the Potato Moth (*Phthorimæa operculella*), and the author gives an account of various experiments undertaken for the purpose either of preventing infestation of sound stored tubers, or of effecting the destruction of the larvæ, pupæ and eggs in or on tubers already infested.

He found that the immersion of infested tubers in solutions of formalin, mercuric chloride, copper sulphate and sulphuric acid was of very doubtful value; for the length of the immersion or the strength of the solution necessary to kill the insects involved extensive injury to the tubers. Similarly, the coating of the tubers (either by immersion or spraying) with mercuric chloride, lead arsenate, copper-soda mixture, lime-sulphur or Paris green, is stated to be ineffective as a means of permanently preventing infestation; for observation tended to show that the larvæ did not ingest any material until they had penetrated into the starchy tissue of the potatoes.

The only satisfactory results were obtained by fumigation with carbon bisulphide. Experimental trial over a considerable range of conditions has shown that the larva, whether in the substance of the tuber or isolated from it, succumbs after 15 to 16 hours' exposure to an atmosphere containing this compound in the proportion of 1 to 2 lb. per 1,000 cubic feet of air. It requires, however, at least 48 hours' fumigation at either of the above rates to destroy the pupa, and a single application under these conditions does not invariably suffice. In the majority of the experiments the eggs succumbed to a single fumigation of 48 hours' duration; a second fumigation should be applied 6 to 8 days after the first.

Experimental investigation has shown that commercially sound unsprouted tubers may be subjected to intermittent fumigation with carbon bisulphide (1 to 2 lb. per 1,000 cubic feet of space) 2, 3, or even 4 times without producing serious damage to the tuber buds, if each fumigation is limited to a period of 48 hours' duration. Tubers fumigated intermittently under the above-mentioned conditions and subsequently stored in a dry, airy, place for periods of from 2 to 3 months, have, on planting, yielded quite as good crop results as similar, but unfumigated, control tubers.

**Wireworm.**—*Jl. Dept. Agric. and Tech. Instruction, Ireland,* xiii, no. 4, July 1913, pp. 761-763, 2 figs.

The department draws attention to the fact that preventive measures against wireworm are far more efficacious than remedies and that the best safeguard against the pest is thorough cultivation and appropriate manuring.

The pasture cannot be ploughed too early. Have it eaten short, and so soon as it ceases to benefit stock, plough it down.

Plough with a good strong furrow; use a skim coulter, to make sure of burying all with the sod; and use a tailpiece to the mould board to ensure that the furrow is well broken. By ploughing early with a well-broken furrow, rapid and more thorough decay is induced, and the wireworms are subjected to a long period of starvation till the next crop is sown. For the same reason the grain stubble should also be ploughed early, and, while the land is in roots, the opportunity should be taken to clean it thoroughly of weeds, as not only are they a hindrance to the root crop, but such of them as survive are so much winter food for wireworm.

In spring the chief aim must be to obtain a vigorous young growth of shoots that will be resistant to wireworm and grow quickly beyond the stage at which they are most easily injured. Such a growth is best secured by having a well prepared seed bed, by not sowing too early, and by judicious manuring. When there is a likelihood of a crop of lea oats being attacked by wireworm the application of the following mixture of artificial manures is strongly recommended:—1 cwt. sulphate of ammonia, 3 cwts. superphosphate, 3 cwts. Kainit per acre.

The use of this dressing involves some outlay, but it must be borne in mind that its application is calculated to produce not only a vigorous initial growth resistant to wireworm, but also an increased yield of superior quality grain; further, the corn will ripen earlier and be ready for cutting sooner than would otherwise be the case.

Where wireworms are feared, the first grain crop sown after pasture should be a strongly "tillering" variety, such as Potato oat, and oats which do not tiller freely should on no account be sown.

When a wheat crop is being damaged by wireworm, remedial measures are not very satisfactory. Some good may be done at times, however, by heavy rolling and by a top dressing of 1 cwt. nitrate of soda per acre.

Birds which follow the plough, especially starlings, gulls, and lapwings do great service by eating wireworm, and they should be protected and encouraged.

Dressings of lime, gas lime, salt, rape meal, &c., have been frequently recommended as preventives of wireworm attack. there is, however, little direct evidence that they serve this purpose, and the Department consider that it is unwise to rely too much on such remedies.

PRATT (H. C.). **General Notes concerning Locusts.**—*The Agricultural Bulletin of the Federated Malay States, Singapore*, vol. i, no. 12, July 1913, pp. 428-430.

Large numbers of *Pachytylus danicus* having appeared somewhat suddenly in the Federated Malay States, the author gives a short account of their habits and concludes with the suggestion that planters and others in various parts of the States should assist the Department of Agriculture by reporting breeding-grounds and the appearance of the young.

**Insectes nuisibles dans la Province (Quebec). Le "San José Scale."** [Injurious Insects in the Province (of Quebec). The San José Scale.]—*Le Naturaliste Canadien, Quebec*, xl, no. 1, July 1913, pp. 8-12.

*Aspidiotus perniciosus*, called in English the San José Scale and in French the Kermès San José, has just been observed for the first time in the Province of Quebec, where it was found on the bark of a young *Sorbus americana* (Service-tree, Maskuabinas), in a garden at Sainte-Anne de Bellevue. The plant appears to have come from a nursery in Ontario.

Schultz (C. H.). **The Italian Bees at Alabang, Rizal.**—*Philippine Agricultural Review, Manila*, vi, no. 7, July 1913, pp. 335-339, 1 fig.

The author tells the story of two hives of imported Italian bees sent to Alabang at the end of November 1912. Red and white ants were kept from the hives by a gutter filled with water, and they were not troubled by other parasites. One hive contained a queen bee, the other had been without one from about the 10th of November. In this two frames containing young brood and eggs were placed on the 4th of December and on the 23rd a young queen was introduced by Pond-Simmin's method. She flew out several times, and on the 21st of January began to deposit eggs. The old queen was protected, and on the 10th of April the first males of the season were obtained from eggs laid by her. Besides her hive and that of the young queen, there are two nucleus hives with virgin queens, drones and workers in abundance, all being in a thriving condition; so that the question whether Italian bees can be propagated has been answered in the affirmative.

**Legge per prevenire e combattere le malattie delle piante.** [An Act to prevent and control Plant Disease.]—*Atti Parlamentari, Camera dei Deputati* (No. 1430-1430A), *Senato del Regno* No. 1142-1142A), *Rome*, 1913.

The following measures with regard to the diseases of plants are prescribed by the Italian law enacted in June, 1913.

"Art. 1.—The owners and managers of horticultural establishments and nurseries, who produce or trade in plants, parts of plants, and seeds, must notify themselves to the prefect of the province.

"The Ministry of Agriculture, Industry and Commerce has the right to cause an inspection to be made of the cultivations and of the produce, wherever they be kept, and to prohibit their sale if they should be found to be infected, or to order the necessary disinfection.

"Art. 2.—The Ministry of Agriculture, Industry and Commerce may, by means of a ministerial decree:—

"(a) suspend the importation into the Kingdom and the transit through it of plants or plant products, if these be found to be infected;

"(*b*) determine the ports and the frontier stations through which alone the importation from abroad of living plants, seeds and other plant products shall be allowed;

"(*c*) prevent the exportation of plants, parts of plants and seeds from the territory of communes in which the existence of infectious diseases has been ascertained.

"Art. 3. The inspectors of the Ministry at the ports and frontier stations have the right to:—

"(*a*) enforce the disinfection of plants, parts of plants and seeds which they may consider infected, as well as of the packing cases and any other object which may be a vehicle of disease germs;

"(*b*) prohibit the importation into the Kingdom, and transit through it, of plants which they consider infected or bearing germs of disease."

Other articles deal with compensation, the power to enforce the use of remedies, the formation of associations, penalties, &c.

Cimatti (V.). **Le cocciniglie e i pidocchi degli agrumi, olivo e fico.** [The coccids and lice of citrus plants, the olive and the fig.]—*Rivista di Agricoltura, Parma*, xix, no. 30, 25th July 1913, pp. 468, 469.

The writer states that the Bianca-rossa (*Chrysomphalus dictyospermi variopinnulifera*), the Bianca (*Aspidiotus hederae*), the Pidocchio (*Lepidosaphes beckii*), the Pidocchio nero (*Parlatoria zizyphi*) the Bianca dell'ulivo (*Aspidiotus betulae*) and the Rugna of citrus plants and the olive (*Saissetia oleae*), which appear on these trees and on the fig in March, June, August and October, should be sprayed with polysulphides of lime, as soon as the leaves show a large number of little reddish brown, white, or black circles. The spraying should be done in such a manner as to form, as far as possible, a uniform white layer on the leaves. In the first year the process should be repeated for each generation of the insects, and if the infection is severe it is advisable to spray the trees both upwards and downwards. From 10 to 45 litres, or an average of 20 litres per tree are required. The best time to combat the Rugna is when, at the beginning of June and the end of August, small red insects are observed on placing the infested branches of citrus or olive trees on white paper under an inverted glass.

**I sali di arsenico in viticoltura ed in agricoltura.** [Salts of arsenic in vine-growing and in agriculture.]—*Rivista di Agricoltura, Parma*, xix, no. 32, 8th August 1913, p. 499.

In a report to the Sanitary Authority by Professors G. Ampola and S. Tommasi the objections to the use of arsenical salts as insecticides are thus enumerated. Their free purchase may be the cause of crime; they may, in the hands of unskilled workmen, cause accidental poisoning; the arsenic carried from the fields

and gardens into damp dwellings on boots and clothing may cause arsenical mildew, emitting poisonous gases, and may, in the same way, poison articles of food and other products in shops; useful insects and game, and even honey, may be rendered poisonous; as much as 2 mg. per kilo of fruit and 1 mg. per litre of wine is found where arsenical compounds have been used, and continued use of such products may be deleterious: the grass under the plants sprayed may poison domestic animals, and rabbits, birds and snails, though themselves immune, may transmit the poison; and the accumulation of arsenic in the ground might injure vegetation, especially woody plants, and render their fruits dangerous.

**Report on the Forest Administration of the Central Provinces for the year 1911-1912.**—*Indian Forester*, xxxix, no. 8, August 1913, p. 388.

The borer, *Hoplocerambyx spinicornis*, has done considerable damage to the Sal in Mandla, and further information as to whether it attacks healthy trees or only weaklings is required. Mr. Haines notes that opening out the cover appears to favour the pest, so that too free cutting out of the infected trees appears to increase the damage. Mention is also made of *Cyrtotrachelus longipes*, F., which has appearently been damaging bamboo shoots in Sangor.

Britton (W. E.). **The Apple-Tree Tent-Caterpillar,** *Malacosoma (Clisiocampa) americana*, **Fabr.**—*Bull.* 177, *Connecticut Agric. Exper. Stat., New Haven, Conn.*, August 1913, 20 pp., 16 figs.

This bulletin, rewritten from Bulletin 139 (1902), was issued owing to the unusual abundance in Connecticut in 1913 of *Malacosoma americana*, the outbreak covering the entire State, except for certain localities along the coast. In ordinary seasons the caterpillars feed upon several species of wild cherry and do little harm in the orchard, though trees along roads and in hedge-rows may be attacked. Nevertheless, when abundant, as at present, many apple trees are defoliated. Cherry, apple, plum, peach, rose, witch-hazel, beech, barberry, oak, willow, poplar, and birch are mentioned as food-plants. A brief account is given of the life-history, and points of difference from its congeners.

Much can be done in the winter months to destroy the egg-masses. When the trees are bare these can be easily seen near the ends of the twigs and can be clipped off by means of a long-handled tree-pruner. Removing the nests with a special brush is also effective, the brush being made of stiff bristles twisted in heavy wire and trimmed to the shape of a cone about six inches long. The author does not recommend burning, because there is danger of severe injury to the tree. For spraying, 3 lb. of lead arsenate or ½ lb. Paris green should be used for each 50 gallons

of water, or the same quantity of Bordeaux mixture. When Paris green is used without Bordeaux mixture, 3 lb. of the lime to one of poison should be used to prevent burning the leaves. An instance is given of the advantage of offering prizes to school children for collecting the egg-clusters of the pest. In Newfields, N.H., where they were offered 10 cents per 100 clusters, 8,250 egg-masses were collected; and if each cluster contained 150 eggs, which is a small average, 1,237,500 eggs were destroyed at a cost of \$8.25. An interesting contest in Newtown, Conn., resulted in school children gathering 16,864 nests, weighing 1,300 lb., which were subsequently burned.

BEAIS (MAX). **Les Insectes et le Froid.** [Effect of cold on insects.] *Le Moniteur d'Horticulture, Paris*, no. 16, 25th August 1913, pp. 184, 185.

The author draws attention to the common belief that winter frosts destroy insects and that if they fail insect pests may be expected to be very numerous. He says that this is little better than a superstition, and that while frost, particularly if sudden, is effective in destroying slugs and snails, insects are by no means seriously affected even by severe cold. Various instances are cited in support of this statement, and the author says that the only practical effect of cold is to delay somewhat the life processes of the insects. On the other hand a mild winter, far from being an indication of a severe outbreak of pests, rather tends to their diminution.

SANNINO (F. A.). **Un nuovo rimedio contro la filossera.** [A new remedy against Phylloxera.]—*Rivista di Viticoltura, Conegliano*, xix, ser. 5, no. 16, 15th Aug. 1913, pp. 363, 364.

Prof. Sannino expresses scepticism with regard to a story, going the round of the Italian newspapers in July, to the effect that the planting of tomatoes in a Phylloxera-ridden vineyard had given a new lease of life to the dying vines, that the roots of the tomato plants were found to be loaded with dead insects, and that this was due to the solanin contained in the tomato. He thinks the vigour of the vines may have been increased by manuring the tomatoes, or by irrigation, which may at the same time have killed some of the insects; but he is of opinion that these effects, as also the benefit of sandy soil, which favours the vine and retards the multiplication of the pest, cannot be lasting, and that the Phylloxera always triumphs eventually.

CARCANO (C.). **Conservazione del frumento.** [The preservation of wheat.]—*Rivista di Viticoltura, Conegliano*, xix, ser. 5, no. 16, 15th August 1913, p. 381.

This note counsels the whitewashing of the ceiling and sides of granaries, before wheat is stored in them, with milk of lime

and the washing of the pavement with ash-lye or a solution of potash. Sulphur (30 grammes per cubic metre) should also be burned in the granary, which should be kept closed for two or three days and then left open until storage. For certain pests, such as weevils and moths, it is further advisable to put wide-mouthed vessels containing sulphide of carbon (15 to 20 grammes per 100 kilogs.) into the wheat, when it is from 50 to 75 centimetres high in the granary, covering it up with canvas and keeping the granary hermetically closed for five or six days; the fumes will destroy every insect in the wheat. When the cloths are afterwards removed, ordinary ventilation will free it from all smell left by the sulphide.

KELL (D.). **Some field notes on a soft grey scale known locally as the "Longulus" scale.**—*Mthly. Bull. State Commission of Horticulture, Sacramento*, ii, no. 8, August 1913, pp. 617-619.

This scale is as yet undetermined. It frequents orange trees in various parts of California, including the Claremont and Pomona district. It bears some resemblance to *Coccus hesperidum*, but is less fostered by ants, grows to a larger size, is more grey, less shiny, and the more transparent young lie flatter, as a mere film, on the leaf. It is practically viviparous, though eggs are occasionally found among the larvae, of which there may be as many as 500 under one scale. The hatch lasts from the beginning of May to about the 21st of August, and after this the mother scales, then formed almost wholly on the smaller twigs, become dry, turn light brown and fall off, leaving whitish marks. The smut from the honeydew secreted soils Valencia oranges a great deal, but the navels are picked too early to suffer. The author tabulates the effects obtained by fumigating 57 trees with sodium cyanide, according to the Woglum system. The results were not uniform, but they point to the possibility of obtaining a fair killing between about the 20th of July and the end of August, a three-quarter dosage being sufficient, and the 57 trees were, at the time of writing, fairly free from both "longulus" and black scale, of which there was much on the surrounding trees.

SMITH (H. S.). **A Bill-Bug injurious to small grain** (*Sphenophorus discolor*, Mann.).—*Mthly. Bull. State Commission of Hortic., Sacramento*, ii, no. 8, Aug. 1913, pp. 619-621., 2 figs.

The beetle mentioned by the author appears to breed in the roots of *Scirpus lacustris*, and it has been doing considerable damage to barley, wheat and oats grown on land in California reclaimed from this bulrush; the destruction of which, it is anticipated, will deprive the insect of a breeding place and cause its disappearance. It commonly clings head downward to the stalk of the grain, inserts its proboscis through that part

of the stem known as the boot, and entirely severs the main stalk bearing the head. The heads turn white and the kernels fail to develop.

WELDON (G. P.). **The Codling Moth** (*Carpocapsa pomonella*, Linn.).—*Mthly. Bull. State Commission of Hort., Sacramento*, ii, no. 8, Aug. 1913, pp. 619-621, 2 figs.

The author suggests that when the crop is light, and more insects have to share the available fruit amongst them, the calyx application of lead arsenate, or any other good arsenical spray, must be made before the calyx cups close, which is scarcely more than a week after the apple petals fall, but longer with pears, some of which never close the calyx entirely. This, at any rate in the case of the apple, will kill all larvæ trying to enter at the calyx end, as most of them did this year, throughout the season.

ESSIG (E. O.). **The Manzanita Serica** (*Serica anthracina*, Lec.). —*Mthly. Bull. State Commission of Hortic., Sacramento*, ii, no. 8, Aug. 1913, pp. 622-623, 1 fig.

This beetle feeds on the manzanita, black oak, lupines and *Ceanothus* sp. Apparently owing to shortage of green wild plants brought about by the drought, it has this year attacked orchard trees, especially the prune and apple, in Bowman, Placer County; Nevada City, Nevada County; Placerville, El Dorado County; Inyo County and Fresno County—all in California. It eats the leaves to the stem, sometimes killing the trees by completely defoliating them. If the plant be ever so lightly touched, or even if the beetle perceives the approach of anyone, it drops to the ground and secretes itself. The best remedy is a spray of 8 lb. lead arsenate, 8 lb. lime and 100 galls. water, with which the tender tips and twigs should be liberally drenched as soon as the insects appear in spring, repeated applications being resorted to in order to ensure thorough protection.

ESSIG (E. O.). **The Prune Aphis** (*Aphis prunifoliae*, Fitch.).—*Mthly. Bull. State Commission of Hortic., Sacramento*, ii, no. 8, Aug. 1913, p. 624, 1 fig.

This aphis, the author states, has appeared in many prune-growing sections of the Sacramento Valley. It attacks the tips of the twigs and its very large colonies collect more especially on the under sides of the leaves, which they curl slightly. On the 10th May last, Syrphid flies and internal hymenopterous parasites promised to subdue the pest in Yolo County, but in other places a coarse spray of nicotin sulphate, in the proportion of 1 to 1500, has had to be forced at high pressure through the rather thick coating of fine white waxy powder secreted by the insect, in order to destroy it.

**Essig (E. O.). The Destructive Eleodes** (*Eleodes omissa* var. *borealis*, Blaisd.).—*Mthly. Bull. State Commission of Hortic., Sacramento*, ii. no. 8, Aug. 1913, p. 627, 1 fig.

This Tenebrionid has done much damage to orange trees around Bakersfield and has stripped a number of apricot and plum trees at Wasco, both of which places are in Kern County. The *Eleodes*, which was so thick as to cover the ground, also severely injured the watermelon vines. It is highly resistant to sprays, and poisoned bran is equally unsatisfactory, as the insects prefer plant food. Its unusually great multiplication is attributed to the very dry season.

**Ritzema Bos (J.). Plantenziekten door dieren veroorzaakt.** [Plant diseases caused by animals.]—*Mededeelingen van de Rijks Hoogere Land-, Tuin- en Boschbouwschool, Wageningen*, vi. no. 3, 1913, pp. 133-158.

This paper contains information on noxious insects sent to the Wageningen Agricultural College in 1911. *Silpha atrata* attacked beet in Ettelsbrück (Luxemburg), and it seems that the larvae prefer soil fertilised with potassium salts; Paris green is an efficient check. *Lyctus canaliculatus* bored timber and furniture at Klundert (N. Brabant). The injection of benzol or carbon bisulphide into the boreholes will kill the larvae. *Meligethes aeneus* is a pest of seed cabbages near Haarlem; spraying with Paris green before the plants are in blossom is recommended, but the presence of other food-plants in the neighbourhood makes control difficult. *Phyllobius calcaratus* attacked the bark layer of raspberry shoots at Enschede, and also damages alder, birch, willow and hazel. *Otiorrhynchus singularis* (*picipes*) defoliated horseradish at Uden (N. Brabant), and *O. sulcatus*, yew, rhododendron and laurel at Rotterdam. At Boskop the latter is known as the Yew beetle. *Ceutorhynchus assimilis* is a serious pest of cabbage sprouts near Breda, but little can be done against them except spraying with Paris green. *Eccoptogaster rugulosus* was received with damaged plum-twigs from Serajevo (Bosnia). *Bruchus pisi* was common at Wageningen and throughout Holland in 1911 owing to the dry warm weather. *Phratora vitellinae* is a pest of osier-willow at Haarlem, and it is advisable to spray the underside of the leaves with Paris green.

*Cossus cossus* infested nurseries at Baarle-Nassau and Opheusden; where the damage is not too great the larvae may be killed in the trees with carbon bisulphide, and the bore-holes subsequently stopped with clay. *Lymantria monacha* practically defoliated 750 acres of fir woods near Rosendaal (Gelderland). In certain parts the caterpillars were decimated by flacherie. *Tropicoris rufipes* was found at Kootwijk (Gelderland) to destroy the pupae of the nun-moth. *Phlogophora meticulosa* infested strawberry plants at Alkmaar from May to October. Two, and perhaps three, generations occur annually and the number of host plants is great. *Cheimatobia brumata* was found to be very

destructive in Delden, Dirksland, Maurik and Opheusden, the caterpillars chiefly infesting apple and cherry trees; banding the trees with tanglefoot is recommended. *Rhyacionia buoliana* was destructive to firs at Meyel (Limburg), and *R. resinella* did similar damage at Hilversum. *Tortrix murinana* damaged spruce at Ubbergen. *Eucosma tedella* occurred on *Picea excelsa* in the neighbourhood of Groningen. The needles became brown and died, but the trees generally recovered the following year. It was noticed that trees standing in shady spots were preferred by the pest. *Leucoptera scitella* mined apple leaves at Koudekerke and was found on different fruit trees at Breda. *Acrolepia betulella* was a pest of leeks and onions at Wageningen, Breda and Gouda.

*Cecidomyia rosaria* infested osiers at Ommeren. *C. brassicae*, together with *Ceuthorrhynchus assimilis* damaged cabbage shoots at Breda, and seed cabbage at Haarlem. *C. saliciperda* was a pest of willow at Voorthuizen, but can be checked with tanglefoot. *C. piricola* caused immature pears to fall at Wilhelminadorp, Rockanje, Oyen and Wilp. All windfalls should be collected. *C. (Monarthropalpus) buxi* mined box leaves at De Bildt (Utrecht). This is the first recorded appearance of this pest in Holland. *Anthomyia antiqua* infested shalot in Oosterhout and Amsterdam, and leek at Breda. *A. brassicae* damaged cabbage roots at Nieuwer Amstel, Deventer, Amersfoort, Bornagiekerk, Wagenborgen and Sittard. *A. coarctata* infested winter wheat at Andel and Zuurdijk; not much can be done against this pest except early sowing and encouragement of growth with nitrates. *A. conformis* was mining beet leaves in Veendam, Winterswijk and Utrecht. *Merodon equestris* infested narcissus bulbs from different flower-bulb growing districts. *Oscinis frit* was reported as having imperilled the oat crop at Herwen, and it is advisable to resort to early sowing if this pest is numerous. *Hydrellia griseola* mined barley leaves at Groningen, but was not a serious pest; it has also been recorded from oats and rye-grass.

*Hylotoma rosae* was reported from Breda, Heemstede and Zuylen, where it damaged roses, the larvae injuring the leaves in July, the adult cutting the young shoots in August, and the larvae of the second generation injuring the leaves in September and October; Paris green and lime-water (1:1,000) is suggested as a spray. *Cladius viminalis* infested a whole avenue of young poplars at Laren. *Nematus septentrionalis* completely defoliated an alder hedge at Assel, and also occurred on birch, willow, poplar, &c. *N. ventricosus* did serious damage to currants at Borne, Wapenveld and Ubbergen. *Eriocampoides aethiops* skeletonised rose leaves at Dedemsvaart, Zuylen and Wapenveld. American insect powder is recommended against this as well as the last-named pest. *Hoplocampa testudinea* attacked young pears in Wilhelminadorp and apples in Heenvliet, causing them to fall prematurely.

*Aphis padi*, usually met with on *Prunus padus*, swarmed on apple trees in several localities. *Chermes pini* was recorded from several places on *Picea orientalis* and *P. excelsa*.

MACDOUGALL (R. S.). **Insect Pests in Scotland in 1912.**—*Trans. Highland & Agric. Soc. of Scotland*, 1913, reprint, 17 pp., 9 figs.

The author prefaces his survey by recalling the fact that a spray of 1 part nicotin in 400 of water kills larvae and newly formed pupae of the chrysanthemum leaf-miner, which also attacks marguerites, and 1 in 200 kills pupae of all ages; the American "Black Leaf 40," a concentrated solution of nicotin sulphate, is very effective.

*Phorbia brassicae* (the cabbage-root fly) attacks cabbage, cauliflower, turnips, swedes, garden plants and Cruciferous weeds. The larvae tunnel in turnip and swede leaf-stalks and have also been found in cabbage leaves, but they generally infest the roots, emerging from eggs laid close to the plant in cracks in the soil, or on the stem below the surface. Pupation takes place in the soil or in the plant, the first flies appear about the end of April, and a later brood carries laying on to the autumn. Seedlings may be protected by cheese-cloth stretched on a frame. Apply to the roots, before the larvae have bored into them, two oz. of fresh white hellebore, steeped for half-an-hour in a gallon of hot water, at the rate of 1 pint to every 3 plants; or 30 parts water to one of the following: 1 lb. hard soap dissolved in 1 gall. boiling water, and churned thoroughly with 1 pint crude carbolic oil. In gardens, sand mixed with a little paraffin may be sprinkled round the stems, or a teaspoonful of carbon bisulphide may be poured into a hole near them, care being taken not to touch the plants with the liquid.

*Lochmaea (Adimonia) suturalis*. This insect typically spends the winter as an adult, but during the summer and autumn all stages are found, and, as in Ayrshire and Argyllshire last year, it is specially destructive of the heather shoots and leaves in July, August and September. Pheasants and black game eat the beetle readily, but the only practicable remedy would be burning the heather, if a permit were obtained to do this after May, when the insect is especially harmful.

*Helophorus rugosus* (turnip sand-beetle) is seldom troublesome, but a stimulating dressing should be applied if it attacks the plants, which should be ploughed in deeply if they have suffered much. The tuft of young leaves is eaten away at the edges, irregular patches are bitten out of the bases of the leaf-stalks and the swollen roots are gnawed. In November larvae were found feeding in the heart of the youngest central leaves, and pupated in the soil.

A description is given of *Tribolium confusum*, *T. castaneum* (*ferrugineum*), *Tenebrioides* (*Trogosita*) *mauritanicus*, *Ephestia kuehniella*, *Calandra granaria* and *C. oryzae*.

The *Chermes* of the Silver Fir uses a *Picea* as its primary and *Larix*, *Pinus* or *Abies* as its secondary host, and its normal life-cycle may take two years. It deforms and curls up needles, and infests shoots, the attack upon which and upon the older barked parts may kill the plant. The tufts of woolly-looking material on the bark should be thoroughly brushed with a bristly

broom, before infestation spreads, or sprayed with paraffin emulsion, made by dissolving 1 lb. soft soap in 2 qts. boiling water, adding, at the same temperature, 1 pt. paraffin, and churning into a buttery mass. This, diluted in 5 gals. soft water, is useful against related forms on spruce, as is also a spray of 1 lb. soft soap to 1 gal. soft water. Badly infested Silver Fir nursery plants should be burned at once.

*Otiorrhynchus picipes* (the raspberry or clay-coloured weevil) and *Phyllobius maculicornis* (a leaf weevil) were very destructive, in Perthshire and elsewhere, last winter. *Otiorrhynchus* bites out the buds and gnaws the bark of shoots of raspberry, apple, plum, strawberry, damson and a number of broad-leaved trees. *O. sulcatus* hollows out underground begonia shoots, and the larvae of both species attack pot-plants in greenhouses. They hibernate sometimes as adults, but generally as larvae, pupating following in spring. Adults of *O. picipes* were found damaging oak and hazel in April, and rose-stocks, in Dumfriesshire, in May. The adults of *Phyllobius maculicornis* play havoc with the buds and leafage of young broad-leaved trees like birch, of rosaceous fruit-trees and of grafted plants, as do also those of *P. oblongus*. In 1912, *P. maculicornis* appeared in great masses on the raspberries. In summer the insects pair and pass to the soil to lay; the larvae feed at the roots. Vaporite incorporated in the soil is useful against them. Tanglefoot bands round the stems trap *Phyllobius*, or the adults can be easily shaken on to tarred boards or cloths in the early morning or on dull days. For *Otiorrhynchus*, this should be done while it is feeding at night; and as it hides in the daytime, sacking or bands of hay at the foot of the plants should be used as traps. Well painted walls, with a band of tar at the base, will keep it from wall fruit trees, as it cannot fly.

*Hylurgus piniperda* (the pine beetle) breeds in felled or blown timber, which should be removed, or at least barked, by the beginning of May at latest; or, when blown down in summer before two months have passed. Sickly trees should be felled here and there and left unbarked. The maturing broods can be destroyed before two months have expired by barking these trap-trees (of which relays should be arranged from April through the season) and burning the bark.

SILVESTRI (F.). **Notizia preliminare di un *Tetrastichus* (Imenottero Calcidide) parassita di *Ceratitis* e *Dacus* nell'Africa occidentale.** [Preliminary notes on a *Tetrastichus* (Chalcididae) parasitising *Ceratitis* and *Dacus* in West Africa.]—*Reale Accad. Lincei, Rome*, xxii, ser. 5, part 5, Sept. 1913, pp. 205-206.

The author describes *Tetrastichus giffardi*, sp. n., found by him parasitising *Ceratitis stictica*, Bezzi, and *C. giffardi*, Bezzi, in Nigeria in November last, and in pupae of *Dacus cucumarius*, Sack, in Kamerun, of *Ceratitis* on the Gold Coast and of *C. giffardi* in Dahomey, in January. Each parasitised pupa of

*Ceratitis* or *Dacus* was observed to yield from 15 to 34 parasites. The eggs are laid in those of the host or in the newly hatched larvae, not in those which have already worked their way into the fruit, nor in the pupae. It has not yet been ascertained whether a separate egg is laid for each individual, or whether one polyembryonic egg produces all those in the same host.

HOOKER (C. W.). **Report of the Entomologist.**—*Ann. Report of Porto Rico Agr. Experiment Station for* 1912, *Washington*, 1913, pp. 34-38.

The insects enumerated by the author as being troublesome during the past year comprise sugar-cane borers, *Pieris monuste* (cabbage worm), *Eudamus proteus* (bean-leaf roller), *Cerotoma trifurcata* (bean-leaf beetle), *Laphygma frugiperda* (corn-ear worm), *Diabrotica vittata* (cucumber beetle), *D. graminea*, very abundant in the south and confining itself chiefly to weeds, and a beetle which is probably *Bostrychus monachus*. The adult of the last has been boring in grape fruit trees, pigeon pea, *Agati grandiflora* (gallito), flamboyant (*Poinciana regia*) coffee and citron, but only burrows, without eggs, larvae or pupae, were found, and the principal host plant is thus unknown.

The most troublesome coffee pest is *Myrmelachista ambigua ramulorum*, an ant from Culebra, Arecibo and Utuado, where populous colonies nested in hollow twigs, especially of *Coccoloba uvifera* (sea grape) and *Bucida buceras* ("torchuelo"). In coffee it lives on dead wood and twigs, or under loose pieces of bark on the Guamá, a common coffee shade tree. It feeds largely on honeydew from *Pseudococcus citri* and a large, fleshy, pink scale of the subfamily COCCINAE, carrying the Coccids into canals eaten out along the pith of the smaller new fruit-bearing growth, which becomes so weak as to break easily at harvest time. A native ant called "albayalde," which ousts *Myrmelachista*, is an effective remedy, while tanglefoot, repellants and poisons have been tried in vain, but the pickers fear its sting much more than that of its victims. *Leucoptera coffeella* (the coffee leaf-miner) is only kept down in certain parts of the island by two Chalcid parasites, and no better remedy is known. *Psychonotua* sp., known to bore orange, citron, rose apple and sweet almond in 1908, has now riddled coffee trunks and larger branches in some districts. If the burrows are short, a wire will kill the larvae; if not, the trees must be burned. In certain hilly parts coffee weevils feed on the leaves of coffee when the tree is fruiting, the larvae living on the roots.

"Caculos" (May beetle) in the hills also eat coffee leaves when adult, and the larvae the roots of sugar cane, coffee, citrus trees, pineapple and aguacate. In the west it is parasitised by a Tachinid (*Cryptomeigenia* sp.), and the extension of the parasite to other parts is being considered. *Metarrhizium anisopliae* is being distributed, with instructions for growing on yams and sweet potatoes. When the fungus turns

dark green a few squares should be mixed with several inches of earth in a box tightly covered with wire or cloth, some pieces of cane with tender leaves should be planted in the earth, kept moist, but not muddy, and a number of beetles should be rubbed over with fungus and kept in the cage. In a few days many will be dead and covered with fungus, and they and squares of fungus, mixed with earth, should be distributed at the base of the cane or trees, while the live beetles should be set free in the fields. A cage will serve for months, being filled with fresh beetles, and the cane being renewed so as always to have fresh leaves.

*Anastrepha* sp. breeds freely in "mangó de puerco," some Indian mangos, such as the Cambodiana, guava, jobo amarillo and jobo de la India. In jobo the larvae are commonly attacked by *Opius (Utetes) anastrephae*, Viereck, and *Ganaspis* sp. n., but in other hosts, many of which grow wild, it has unmolested access to the fruit, and in some cases all the year round. *Toxotrypana curvicauda* (the lechosa fruit fly) abounds at Mayaguez and is also found in Antigua, Brazil, Peru and Yucatan, the eggs are laid well below the surface of the green fruit, within which 2 to 15 larvae mature; and when it drops they pupate in the soil at a depth of 1 or 2 inches. The adults emerge in 17 to 21 days and lay soon after. Sweetened lead arsenate spray and daily destruction of the fallen fruit are fairly effective in controlling the pest. In May, *Cryptolaemus montrouzieri* has been distributed among sugar and pineapple growers, against *Pseudococcus citri*. *Hippodamia convergens* has been introduced into Mayaguez from California, to supplement the three native aphis-feeding ladybirds, Syrphid flies and hymenopterous parasites.

Guercio (Giacomo del). **Nuova contribuzione alla conoscenza dei nemici dell'Olivo.** [A further contribution to the knowledge of the enemies of the olive.]—*Redia, Florence*, ix, no. 1, 28th August 1913, pp. 59-75.

The author records that during this year the laying and hatching of the eggs of the *Lecanium* of the olive took place later than in 1912, the hatching lasting from the first half of June to the middle of August. The honey-dew secreted by the adult females is not only the primary cause of the appearance of the *fumaggine* fungus, but also serves as a food for the olive fly, *Oecophyllembius neglectus*, Silv.

A species of *Zeuzera* (locally called Rodilegno, Tarlo bianco or Tarlo giallo) abounds in Apulia on the olive, but only attacks the more delicate varieties, such as the so-called *ogliarole*. The *oleastro* is almost wholly free from it, as is also the wild olive—a splendid variety, not properly appreciated, bearing large and oily olives—and the Nardò olive. This last is to be recommended for the further reason that it is relatively immune from the olive fly, which, with few exceptions, only begins to perforate its olives in October, whereas from 50 per cent. to 100 per cent. of

the *ogliarole* are either spoilt or punctured. The first of the so-called wild olives is only second in importance to those of the Nardo. The *Zeuzera* not only attacks the olives of Apulia and a few plants in Calabria, but is also found in considerable numbers in Sicily and elsewhere. It is more common in the province of Lucca, and in certain parts of Massa Carrara, than in that of Leghorn. Apulia is, however, the region most affected, and not only branches a few years old, but also the larger ones and the trunk itself are injured, provided the bark is smooth. The affected branches dry up in the hottest season, and large numbers of flowers and fruit are lost in consequence.

In this region the labourers climb the trees and strip the galleries of the larvae in the infected branches, which they can recognise from the ground. Eight persons can thus examine from 12,000 to 14,000 large trees in about 20 days, ridding them of from 50,000 to 60,000 larvae. At Serranova, for instance, 45,145 were collected from the 1st to the 18th August 1911, and 46,768 by eight workpeople, from the 24th to the 7th of August 1912. The cost of collection, at 10 francs per 1,000, was 919.31 francs (about £37), an expenditure which saved from 100 to 200 tons of olives. This remedy should not be resorted to until the month of August, and should be continued until the last pupa has been removed. The branches attacked by *Zeuzera* are more subject than others to damage by *Hylesinus*, *Phloeotribus* and other SCOLYTIDAE.

In the spring of this year a very promising olive bloom in Serranova and its neighbourhood was blighted by the *nebbia*, the vulgar name for a legion of insects, the most common among which are the Tignola (*Prays oleaellus*, F.) and the Psylla (*Euphyllura olivina*, Costa), also called Cotonello or Bombacella. The former may be recognised by the perforated buds and by its silky slime and cocoons; the latter by a powdery, wax-like stratum on the dried and ruined clusters.

Experiments showed that the damage done by these two insects was about equal on the whole, though the one or the other sometimes predominated. That due to the Tignola would have been far greater but for the fact that the great majority of the larvae were parasitised by a species of *Ageniaspis*. Unfortunately in many cases this parasite had been killed by a microbe, and therefore did not, as it otherwise would have done, practically free the olives from the Tignola.

The author states that on the first of June he isolated several pairs of *Hylesinus oleiperda*, F., by means of wide glass tubes, upon living olive branches. The insects gnawed out long channels in various parts of the bark, and when the sap flowing into them had dried up, the females placed their eggs in burrows radiating from them. The larvae developed normally and fruit failed to appear on the affected branches. On the other hand, when the beetles were placed on dried wood or on cut branches kept in water, they not only failed to oviposit, but died without even attacking the bark. This proves, contrary to general belief, that *Hylesinus oleiperda* normally attacks living olives.

MALENOTTI (Ettore). **Sopra un nemico naturale della** *Pulvinaria camelicola,* **Sign.** [On a natural enemy of *P. camelicola,* Sign.]—*Redia, Florence,* ix, pt. 1, 28th Aug. 1913, pp. 113-115.

The author records the breeding of *Leucopis nigricornis,* Egg., from a scale-insect, *Pulvinaria camelicola,* sent to him from Ascoli Piceno on leaves and branches of orange, and says that in Europe the fly appears to have been previously recorded only from Austria. It is mentioned by Marsh as the natural enemy of *Macrosiphum sanborni* in the Hawaiian Islands; by Smith as the most common parasite in Nebraska of *Lepidosaphes ulmi, Eriopeltis coloradensis, Chionaspis americana, Ch. pinifoliae,* and *Ch. ortholobis;* and by Howard as the natural enemy of *Pulvinaria acericola* and other United States pests. Many species of *Leucopis* have been noted as parasites of Aphids and Coccids.

**Die Reblaus in Baden.** [Phylloxera in Baden.]—*Luxemburger Weinzeitung,* i, no. 25, 1st Sept. 1913, p. 431.

Baden, so far, has been the only German Federal State with large viticultural interests that was free from Phylloxera. However at the end of August a large 'focus' of this pest was discovered in the Lorrach district; it has probably been introduced from Alsace.

MARCHAL (Paul). **L'Acclimatation du** *Novius Cardinalis.* [The acclimatisation of *Novius cardinalis.*]—*Bull. Soc. Nat. d'Acclimatation, Paris,* no. 17, 1st Sept. 1913, pp. 558-562, 3 figs.

The author sketches the migrations of *Icerya purchasi,* accidentally introduced into California from Australia in 1868; recognised in Portugal, along the banks of the Tagus, about 1873; found at Portici, near Naples, in 1900; met with subsequently in Egypt, Syria, the Greek Archipelago, Dalmatia, and Sicily, and appearing at length at Saint-Jean-sur-Mer, in the French Department of the Maritime Alps, where it was found to have been brought over on plants purchased in Naples in 1910. Local attempts at extirpation were supplemented by the introduction, in July 1912, of *Novius cardinalis,* the natural enemy which, in its native Australia and elsewhere, has reduced this *Icerya* to harmlessness. This experiment has proved entirely successful, for the Coccinellid, having thoroughly established itself, is keeping the scale-insect satisfactorily in check.

STEIN (F.). **Bekämpfung des nashornkäfers.** [Control of the rhinoceros beetle.]—*Tropenpflanzer,* xvii, no. 9, Sept. 1913, pp. 481-488.

On a large coconut plantation in German East Africa, stocked with 300,000 palms, of which 5,000 were bearing, hundreds of palms succumbed daily to the attacks of the rhinoceros beetle.

The author therefore devoted himself exclusively for one year to the study of this pest, and arrived at four main conclusions regarding its control.

In the first place, young palms ought only to be planted on previously cultivated soil, as they are apt to be weakly on recently cleared ground. Where land is being cleared for coconut plantations, all stumps, grass, etc., should be burnt and the ashes uniformly distributed and then deeply ploughed in. Two men should follow the plough and collect all the larvae and beetles. The palms should be planted only one or two years after the ground has been utilised by planting maize, manioc, peanuts, etc.

A second essential method of control is avoiding the proximity of dense forests, which afford the pest an unlimited amount of shelter. It is a safe rule to plant coconut palms at least 300 yards away from the forest, and the latter should be cleared of decaying timber for about 100 yards. The author observed that the flying powers of the rhinoceros beetle are limited to a very short distance.

A mistake is frequently made in planting the palms too close, as the pest thrives in shady spots. For the same reason only crops affording little shade should be planted between the rows. The most suitable of these crops is the sisal agave, which the author observed to have the effect of driving the larvae away. The ground should be kept well hoed.

Clean cultivation is the fourth important point. Special attention should be paid to rotting trunks, as many as one hundred beetles and their larvae being found in a single one. They also prefer soft, porous wood, like that of the "doum" palm.

The author is confident that all these measures, if legally enforced among the natives, will make the pest comparatively harmless in German East Africa, as well as in Samoa. He also mentions the possibility that a fungus disease of the coconut palm, which causes the innermost leaf to rot, is spread by insects.

**Bekämpfung der Rebschädlinge.** [Control of vine pests.] *Weinbau der Rheinpfalz, Neustadt a. Hdt.*, i, no. 18, 15th Sept. 1913, p. 236.

The first result of an international 'entente' regarding the control of vine pests is the collaboration of M. Paillot and Prof. Schwangart in studying the vine moth. Prof. Schwangart will also get into touch with vine-growers in Tyrol in order to discuss spraying and other control methods. The protection of birds is being fostered by the planting of special shrubberies and woods in France and Germany, and a vine-pest committee has been appointed in the German Viticultural Association.

**The Protection of Grapes against *Clysia* by means of paper Bags.**—*Schweiz. Zeits. fur Obst- und Weinbau, Frauenfeld*, xxii, no. 17, 12th Sept. 1913, p. 270.

In Rüdesheim on Rhine grapes were enclosed in paper bags against the second generation of *Clysia ambiguella*. Several owners of vineyards state that this method has been most successful, and the grapes protected in this manner were even better developed than the unprotected ones.

BOHUTINSKY (—). **Verheerendes Auftreten der Kieferneule in Böhmen.** [Devastating appearance of *Panolis piniperda*, Pnz., in Bohemia.]—*Vereinsschrift fur Forst-, Jagd- und Naturkunde, Prag*, no. 4, 1913-1914, pp. 259-260.

In several forest ranges in northern Bohemia *Panolis piniperda* has appeared in such enormous numbers as completely to defoliate the pine-trees in certain localities. In one forest about 15,000 acres of pines were defoliated. The cold and damp weather of June 1913 had no influence on the spread of the pest, but in July tachinosis and the polyhedral disease appeared to check it considerably, and no further spread is anticipated, at least for some districts.

KURDJUMOV (N. V.). МАССОВОЕ ПОЯВЛЕНІЕ ЛУГОВОГО МОТЫЛЬКА [Serious outbreak of *Phlyctaenodes sticticalis*, L., near Poltava.] ХУТОРЯНИНЪ [Jl. of the Agric. Soc. of Poltava], no. 26, 10th July 1913, pp. 697-698.

The author draws attention to the appearance of this insect during recent years and especially to the damage done by it in 1901. In 1909 the moth appeared in great numbers, but owing to the small quantity of caterpillars produced it proved practically harmless. In the summer of last year the insect again appeared in fairly large numbers, and it was observed on the experimental field at Poltava throughout the second half of July and the first half of August, but especially in July. The insects appeared quite suddenly, and as there were no caterpillars the author suggests that it invaded these fields from some other places in the neighbourhood. This year (1913) the insect appeared again quite unexpectedly, but considerably earlier. It was noticed on the experimental field on the 19th May and on the 21st it reached its maximum. At the end of May oviposition took place and soon afterwards the caterpillars emerged and complaints reached the Station of damage done by the latter. In the middle of June the caterpillars passed into the earth and pupated, and at the time of writing the article (beginning of July) the flight of the second brood had started, which is likely to be as numerous, if not more so, than the first. The author recommends the following remedies: (1) to spray the plants with a 2·5 per cent. solution of barium chloride or of Paris green; (2) to dig trenches round the fields, when the migration of the larvae begins; (3) to fumigate the plantations of beet during the time of flight; (4) to mow and remove the fodder-grasses before the end of July; and (5), as suggested by some owners, to collect and kill the insects by hand, when they sit on the leaves of the beets. [For a fuller account of this pest by Mokrzecki, see this *Review*, Ser. A, I, pp. 359-361.]

Recipe of barium chloride suggested:—3 lb. in about 14 gallons of water, or even 15 lbs. in 27 gallons; about 1 lb. or more of molasses may be added to secure adhesion. If Paris green be used:—3-4 lb. of green; 6-8 lb. of caustic lime; about 110 gallons of water.

Maslaev (P.). СОСНОВЫЙ ПИЛИЛЬЩИКЪ [A pine pest, *Lophyrus pini*].—ХУТОРЯНИНЪ [Jl. of Agric. Soc. of Poltava], no. 25, 3 July 1913, pp. 676–677.

Some years ago the larvae of a sawfly, *Lophyrus pini*, appeared in S.W. Russia, and having crossed the river Dnieper, invaded the Government of Poltava. The insect has done great damage to the forests, especially to young trees, by eating away the needles; the growing summits are not touched, as their needles have a bitter taste. The insect has two broods. The first brood emerges and oviposits in May, and the larvae soon begin to strip the old needles, so that the trees turn yellow and cease growing. The second generation appears early in August and the larvae continue their destructive work until the late autumn, pupating underground when the early morning frosts become more intense. Sometimes, however, there is only one generation, when the weather conditions do not favour the development of a second.

The author suggests the following remedies: (1) shaking the larvae from the trees on to cloths by striking the tree-trunks with a wooden mallet—a method which is not very effective; (2) spraying with Paris green, the following recipe being recommended: 1 lb. of green, 2 lb. of copperas and about 3 lb. of slacked lime to 95 gallons of water. Spraying with this solution has given very favourable results in the district of Migorod, in the Government of Poltava.

ОПЫТЫ БОРЬБЫ СЪ ВРЕДИТЕЛЯМИ ОЗИМАГО ИЛИ РѢПАКА [Experiments on fighting the pests of winter rape]. Preliminary Report issued by the Bio-Entomological Station of the Zemstvo of the Government of Bessarabia at Kishinev, 1913, pp. 5.

Winter rape is a very useful plant, but its cultivation has greatly decreased in Bessarabia, owing partly to unfavourable weather conditions, but chiefly to the damage done to it by insect pests. The most serious pests are the larvae of the sawfly, *Athalia spinarum*, which feeds usually on grasses, and *Entomoscelis adonidis*, of which the larva eats the plant in the autumn and spring, and the imago in the summer. Amongst other pests are mentioned:—*Epicometis hirta*, which eats the flowers of rape in the spring; *Strachia oleracea* and *S. ornata* eat the stalks, leaves and pericarps; *Ceuthorrhynchus sulcicollis* oviposits on the stalks near the root-neck and the larvae eat the tissues, causing the formation of abnormal knobs and the withering of the plants; and *C. assimilis* injures exclusively the pericarps. Besides these pests there are also many others which usually do not cause serious damage, except in the years when they appear in great quantity, such as the larvae of *Agrotis segetum* and of *Melolontha vulgaris*—which injure the roots of the plants. The larvae of *Baris picina*, *Baris chloris* and *Anthomyia brassicae* live inside the stalks. The leaves are eaten by the caterpillars of *Pieris brassicae*, *P. napi*, *Feltia (Agrotis) exclamationis*, *Barathra (Mamestra) brassicae*, *Plusia gamma*, and *Plutella maculipennis*; and by the beetles *Haltica oleracea*, *H.*

*nemorum* and *Psylliodes chrysocephala*. The flowers of rape are attacked also by *Meligethes aeneus*; the ripening pods by the caterpillars of *Orobena margaritalis* and by the larvae of *Cecidomyia brassicae*.

The report further describes experiments conducted by the Station on a large plot of 57 acres on an estate on the river Dniester in the district of Orgeev. The sowing of the rape began on the 31st July 1911 and proceeded up till the 6th August. Nothing was noticed till the 21st August, but on the 25th, half of the seedlings were destroyed by *Athalia spinarum*, the enormous numbers of which threatened to destroy the plants on the whole field. Investigation proved that the insects came from some neighbouring plots, on which maize had been sown and in the midst of which *Brassica campestris* grew freely as a weed, and on this plant the larvae had developed.

To fight the insects, spraying with Schweinfurt green and "Krasson" was started on the 29th. The first insecticide was used in a proportion of 1½ lb. of green and 7½ lb. of fresh slacked lime in about 55 gallons of water. The second insecticide was used in the proportion of 15 lb. in 58 gals. of water.

Schweinfurt green gave no favourable results, owing to the peculiar qualities of the leaves of rape, which are covered, as are those of many other cruciferous plants with a greasy substance which repels the insecticide. The second mixture has many advantages over the first: chiefly owing to its ability to absorb kerosene, turpentine and other hydrocarbons and dissolve afterwards in water, the muddy mixture having nearly the same gravity as water. The presence of kerosene lightens the gravity of the insecticide and causes it to adhere to the leaves. The spraying was continued from the 29th August to the 1st September, during which time about 19½ acres were treated by means of the Vermorel knapsack sprayer. The results of the spraying were noticed the day after the spraying was begun. On 1st September the insects were found to be dying in great masses, and when the fields were re-examined on the 16th September it was discovered that the spraying had produced excellent results. The sprayed plants recovered and grew very quickly. No larvae were found on digging in the earth, so they were evidently all destroyed.

On the 26th September the plants were in good condition and some few beetles of *Entomoscelis adonidis* were found. The report points out that whereas the last-named insect usually oviposits in the first half of October and hibernates in the larval stage, that was not the case in 1911. The insects began to oviposit only at the end of October and wintered in the egg stage. This was noticed in 1911 everywhere in Bessarabia.

Noel (Paul). **Destruction de la** *Zeuzera aesculi*. [**The destruction of the Leopard Moth.**]—*Bulletin du Laboratoire Régional d'Entomologie Agricole, Rouen*, pt. 4, 1913, p. 14.

The withering of the cork-oaks of the Massif de l'Edough, in the Algerian Department of Constantine, is chiefly due to the caterpillar of *Zeuzera pyrina*, L., which burrows in the trunk and

branches of the trees. It is probably the same as *Zeuzera aesculi*, the habits of the two insects being identical. Bisulphide of carbon has been used successfully in Algeria against the caterpillar of *Z. pyrina*, the liquid being injected into the gallery and the opening being stopped up with plaster or clay. Where the galleries are vertical, part of the liquid is lost before the aperture can be closed, and to remedy this the sulphide is put into gelatine capsules, the covering of which dissolves in about 24 hours. It has been conclusively proved that the sulphide has no deleterious action on the trees, and in the Massif de l'Edough it has almost entirely freed them, in three years' time, from the *Zeuzera*.

**La Cochylis, l'Eudemis e l'estratto di tabacco.** [Cochylis, Eudemis and tobacco extract.]—*Rivista di Agricoltura, Parma*, xix, no. 34, 22nd Aug. 1913, pp. 535.

Certain figures are quoted from the journal "Economia Rurale" as the results obtained at Lasparre, in the Gironde, in some vineyards two of which were each twice sprayed with extract of nicotin (1½ to 2 per cent.), both vineyards having been attacked by *Clysia* and *Polychrosis* in the same manner and to the same extent. The results show that on 12,276 vines which were not treated there was a diminution of 6,566 litres of wine.

KRASSILTCHIK (I. M.) and VITKOVSKY (N. N.). ОТЧЕТЪ О ДѢЯТЕЛЬНОСТИ БІО-ЭНТОМОЛОГИЧЕСКОЙ СТАНЦІИ ВЪ 1912 ГОДУ [Report of the Bio-Entomological Station of the Zemstvo of the Government of Bessarabia for the year 1912]. Kischinev, 1913, 26 pp.

The report gives an account of work done at the Government Station and the experiments conducted in the experimental garden near Kischinev on different garden pests. Against *Sciaphilus squalidus*, *Rhynchites bacchus*, *R. aequatus*, *R. pauxillus* and *Anthonomus pomorum*, the following remedies were tried:—

(a) Bait-belts with tanglefoot proved of little use against *Sciaphilus squalidus* and *Rhynchites*. The belts served rather to frighten away the insects than to catch them and besides the dry winds prevailing in Bessarabia caused the belts to be covered with dust, which formed a dry coating over which the insects passed freely on to the trees; the belts are also useless as soon as the *Rhynchites* begin flying.

(b) Linen skirts, a modification of the German Insekten-Fanggürtel "Einfach." The skirts were put on the trees in such a way that a great number of pleats were formed at the place where they were tied, and in order that the lower part of the skirts should stand away from the trees a thin wire was put through the edge. These skirts proved very useful and a great number of *Sciaphilus squalidus* and *Rhynchites pauxillus*, as well as other insects, were found underneath them and could be easily destroyed by rubbing the outside of the linen with the hand. Sometimes

as many as 150 specimens of the two insects named were [illegible] in the morning on one tree, especially in cold weather. The [illegible] disadvantage of this remedy is that sometimes useful insects, ladybirds amongst them, get into the skirts and are destroyed.

(c) Zinc bait-rings, being modified bait-rings invented [illegible] Kirjachenko, and consisting of two semi-circular gutters [illegible] nected together by loops and pins each half forming a separate receiver for liquid. The rings were filled with water, a [illegible] stratum of kerosene being poured over it. In order to prevent the insects getting on the tree by way of the thin bridge formed by the adjoining ends of the two halves, this bridge had to be smeared with tanglefoot. These rings proved very effective, as up to 225 insects were secured daily in this way.

(d) Good results were also obtained by shaking the insects from the trees, which were previously sprayed with water.

Spraying the trees with milk of lime was not experimented upon for various reasons. The Station has also studied the biology of the insects, and the connection between the injurious activity of *R. bacchus* and *R. aequatus* and the infection of apples by certain fungi, which are to be proceeded with this year.

*Tropinota hirta*.—Good results were obtained by shaking the insects from the trees which had been sprayed previously with water.

*Laspeyresia (Carpocapsa) pomonella*.—This pest has two broods in Bessarabia. It winters in the larval stage and the first moths appear at the end of May. The first injury to apples was noticed in the first half of July; the pupation of the caterpillars of the first generation began at the end of July, the flight of the moths of the second generation at the beginning of August and throughout the month. During the second half of September the caterpillars of the second generation got into the bait-belts to pass the winter there. Bait-belts were used from the time when the caterpillars of the first generation started pupating till the beginning of frosts, and this remedy is specially recommended against the caterpillars of the second generation which winter in the belts. In the autumn many useful insects were also found in the belts, so that it is suggested that their contents should be examined before being destroyed.

With regard to insects injurious to field crops, the most serious pests of the latter during last year appears to have been *Oscinella frit*. This fly oviposits on the stalks of cereals, near to the earth. The larvae gnaw a passage through the stalk to the central shoot. The observations of last year have proved, that *O. frit* oviposits also on the central leaves of the stalks, in which case the larvae get inside the parenchyma of the leaves, mining them through till they reach the petiole.

The insect winters in Bessarabia as a larva. In the year under report the flies of the first brood appeared at the end of April and were on the wing for about a month. At the end of June those of the second brood began flying, the larvae of this generation appearing throughout July. Observations have shown that the flies of the second generation attack chiefly oats and oviposit mostly on the leaves and on the panicles, which are also attacked

of *O. pusilla*, it being assumed that it is only the latter insect which attacks the grain of oats. In the middle of August the third brood of flies appears, the larvae feeding on fallen corn and on early winter sowings. On the 3rd October the flight of the fourth brood took place and the larvae of this generation damaged the sowings of winter cereals. Thus the insects have four generations and the late appearance of the last one does not allow the owners to protect their fields by late sowings. Even the fields sown from 23rd-28th September were in a great degree damaged by *O. frit*. The injury done by the insect yearly is enormous.

The Station experimented on fighting the insect by means of trap crops, which gave good results; but in order to obtain the same results in practice it is necessary that the method should be applied systematically over the whole area attacked. There is a widespread opinion that in order to fight *O. frit* it is sufficient to plough in the damaged seedlings, as the flies cannot get out from a stratum of earth 7-9 inches thick. An experiment at the Station proved that this opinion is wrong. At the bottom of a glass a number of pupae of *O. frit* were placed, and these were covered with 7-9 inches of earth rammed down and kept wet. The flies got out freely from underneath the earth and the authors presume that they would also be able to get out again from a stratum of earth after ploughing which would contain many cavities and exit holes.

The report deals also with *Spermatophilus guttatus*.

The station has also experimented on the insecticides "Korsaky" and "Arsenit." The first one proved to be very effective in destroying insects, whilst the second one is weaker and merely delays their development.

## Legislation to prevent the introduction of Insect Pests into Mauritius.

*Proclamation* no. 81, *St. Louis, Mauritius*, 6th Aug. 1913.

The importation of the following articles into Mauritius from any country or place whatever is absolutely prohibited: grape-vine cuttings and plants, except when covered by a certificate from the Board of Agriculture, or other competent authority, of the country of origin that the vines have not been exposed to the infection of *Phylloxera* for the six weeks prior to the date of shipment; earth, and leaf and garden mould; sugar-canes or cuttings thereof, and live plants of all sorts; dung (except guano); forage; and timber with the bark on.

The following articles may not be introduced unless written permission has previously been obtained from the Director of the Department of Agriculture:—sugar-canes or cuttings thereof; living plants or bulbils of *Agave* or *Fourcroya*; and tea plants.

The following articles will be inspected at the port of entry:—sugar-canes or cuttings; live plants of all sorts; and fresh citrus fruits from all countries except the Dependencies of Mauritius. If pests or diseases are found amongst them the plants may be either disinfected or destroyed.

If removal is authorised, the plants have to be planted in a separate nursery and are to be subject to inspection by the Department of Agriculture during twelve months from the date of importation.

COSENS (A.). **Reports on Insects for the Year 1912; Toronto District.**—*Ann. Report Entom. Soc. of Ontario, Toronto,* 1913, pp. 17-20, 3 figs.

*Typhlocyba comes* (Grape Vine Leaf-hopper) was very plentiful on *Ampelopsis veitchii*, making the leaves on which it fed pale and blotchy. *Gossyparia spuria*, Mod. (Elm Bark Louse), has not materially injured the larger introduced elms, and *Ulmus americana* is seldom attacked by it. *Euclemensia bassettella*, Clemens, has checked the scale, *Kermes galliformis*, Riley almost to the point of extinction. *Lepidosaphes ulmi*, L. (Oyster-shell Scale), appears to become more destructive each year in the apple orchards, probably because diseased and useless trees are left as centres of infection for the young stocks, and as there are few of these the bulk of the plants are growing too old to resist effectively.

GIBSON (A.). **Reports on Insects for the Year 1912; Ottawa District.** —*Ann. Report Entom. Soc. of Ontario, Toronto,* 1913, pp. 11-17, 10 figs.

In the earlier part of the season *Euxoa messoria* (Dark-sided Cutworm) and *E. ochrogaster* (Red-backed Cutworm) did considerable damage among young turnips, beets, radishes and newly set-out cabbages and cauliflowers. Root maggots, though not so numerous as in the previous year, destroyed many radishes, cabbages, cauliflowers and onions, the Radish Maggot attacking turnips and the Corn-seed Maggot doing conspicuous injury to seed in eastern Ontario, as well as in the Ottawa district. *Lachnosterna* (White Grubs) were very abundant, chiefly damaging strawberries, potatoes and corn. *Mamestra picta* (Zebra Caterpillar) hibernates in the ground in the pupal state and the moths, emerging in May, lay clusters of eggs on the leaves of low-growing weeds and other plants, such as lamb's quarters. The larvae appear about a week later and are full-grown at midsummer, and sometimes they do serious damage to turnips, cabbages, peas and clover. A second brood appears in the latter part of August. At Ottawa, on the 18th September, swarms of the larvae were quickly devouring the cabbage leaves, and in the late autumn they are common on asparagus plants. *Phyllotreta vittata* (Turnip Flea-beetle) and *P. armoraciae* (Horseradish Flea-beetle) are announced in the district, the latter, first observed on radishes on the 31st May, apparently being a new arrival. On the 31st July two adults of *Hylastinus obscurus* (Clover-root Borer), which has caused noticeable loss in the alfalfa, were found in a root tunnelled by the larvae. *Malacosoma americana* (American Tent Caterpillar) caused widespread defoliation. The larvae were first observed hatching on 30th April; by the end

of the first week in May there were thousands of webs, especially on apple and wild cherry trees, and these were being burned in the latter half of the month. In unsprayed orchards *Laspeyresia (Carpocapsa) pomonella* (Codling Moth) was unusually abundant, as were also *Lepidosaphes ulmi* (Oyster-shell Scale), *Hyphantria textor* (Fall Web-worm) and *Eriocampa cerasi* (Pear Slug). *Malacosoma disstria* (Forest Tent Caterpillar) defoliated poplar, birch, maple, oak, ash, willow, apple, wild cherry and raspberry for miles in the Gatineau Valley and from Ironside to Chelsea and Kingsmere. The destruction was complete on 9th June, and in the last week of May and first week of June the larvae, of which such numbers had not been seen by residents of sixty years' standing, constantly stopped the Canadian Pacific trains. The first moths emerged early in July, and about the middle of the month they were ovipositing in myriads on fences, electric light poles and shade trees in the streets of Ottawa. An apparently fungous disease destroyed many larvae, just before maturity in the vicinity of Chelsea, Que. Reference is also made to several minor garden pests.

HEWITT (C. G.). **Review of Entomology relating to Canada in 1912.**—*Ann. Report Entom. Soc. of Ontario, Toronto*, 1913, pp. 34-37.

In the course of his address to the Entomological Society Dr. Hewitt recalls the establishment and objects of the Imperial Bureau of Entomology and the part taken by Canada in securing for it a broader basis. The value of inspection is emphasised by the discovery at Vancouver, in a shipment of trees from Japan, of a *Thuja* bearing eight egg-masses of the Gipsy Moth, from which hundreds of larvae had emerged by the time they were taken on to Ottawa. *Mesoleius tenthredinis*, a new species which had well parasitised the cocoons of the Larch Sawfly in the English Lake District in January, was taken to the Riding Mountain Forest Reserve in Manitoba, apparently the present extreme western limit of the Sawfly, in the hope that it would establish itself there.

HUDSON (H. F.). **The Chinch Bug in Ontario.**—*Ann. Report Entom. Soc. of Ontario, Toronto*, 1913, pp. 46-50, 1 fig.

In Western Ontario *Blissus leucoptera*, which hibernates in the adult stage under leaves and rubbish, paired last year about the middle of May, and the first eggs were observed on the 28th. The first winged specimens appeared on 11th August, giving a lifecycle of 54 days, and the flights began on 5th September. The eggs are laid on the leaf-sheath, or underground on the finer roots. The larvae feed on the roots below the surface for a week at least, and sometimes for a month. Meadow grasses, especially "timothy," suffer most, and wheat, corn and oats have only been attacked when near a meadow. Damp is unfavourable to the insect. *Sporotrichum globuliferum* depends too much upon the weather to be reliable, and an experiment in the artificial

reproduction of the fungus was marred by the cold. Thorough burning of all rubbish as late as possible in the autumn, with regular rotation, is recommended, as also the ploughing in the early autumn, and sowing with wheat, of a strip of land near the wood lots in which the insects hibernate. On their reappearance they and their eggs could be destroyed by efficient ploughing and immediately rolling the ground. There is no remedy for a badly infested meadow except autumn ploughing, followed by a hoe, or a leguminous crop. Corn threatened from a neighbouring pasture may be protected by spraying with a 10 per cent. solution of kerosene, which, however, must not be poured into the heart of the plant and should be applied early in the morning or late in the afternoon. For less vigorous corn, thoroughly dissolve 2 oz. soft soap in 1 gall. of nearly boiling water, then add ½ oz. "Blackleaf 40." If the insects have already taken possession of the corn field, a space about 1 ft. wide, in which holes 12 in. to 16 in. deep are dug from 30 ft. to 35 ft. apart, should be cleared round it before harvesting, and on this clear surface a thin line of No. 7 asphalt road-oil should be poured, passages from the field to the holes being alone left free from it. As harvesting proceeds the insects escape to the holes, and when they have fallen in a little kerosene should be poured on to them.

TOTHILL (J. D.). **Introduction of the Insect Enemies of the Brown-tail Moth,** ***Euproctis chrysorrhoea*****, Linn., into New Brunswick and some Biological Notes on the Host.**—*Ann. Report Entom. Soc. of Ontario, Toronto*, 1913, pp. 57-61.

The author describes the taking of puparia by *Campsilura concinnata*, Mg., about the middle of July, from Massachusetts to St. Stephen and Fredericton. Three miles from the latter colony, across a river almost three-quarters of a mile wide, one of the flies was found to have oviposited in larvae of *Hyphantria cunea*. From Massachusetts 85 adult *Calosoma sycophanta*, L., were also sent to New Brunswick, where, in spite of unusually cold and wet weather, sufficient larvae were reared to attempt their hibernation. One *Calosoma* beetle died, being parasitised by *Biomyia georgiae*, B. & B., also found on the American varieties of *C. calidum*, F., and *C. peregrinator*, Guér. *Trichogramma* sp. and *Phorocera leucaniae*, Coq., are known to be natives of New Brunswick, and it is believed that two more enemies of *Hyphantria*, *Pteromalus egregius*, Först., and *Monodontomerus aereus*, Walk., also live in the country. It is hoped that these will all attack *Euproctis chrysorrhoea* as well as *Hyphantria* in New Brunswick, since they do so in Massachusetts. In the former place nearly 90 per cent. of *Euproctis* nests have been found on apple trees, 3·26 per cent. on bilberry, 2·9 per cent. on thorn, 1·83 per cent. on choke cherry and barley and on other plants. It is suggested that *Euproctis* was blown into New Brunswick from the high lands in Maine, and "breeds back" to its original hosts there; and that the average of 110 less eggs per female than in Massachusetts is due to the greater capacity for long migration of the less weighted individuals.

SANDERS (G. E.). **San José Scale in Nova Scotia.**—*Ann. Report Entom. Soc. of Ontario, Toronto*, 1913, pp. 61-66, 3 figs.

A small quantity of dead San José Scale was found on 8th April 1912 on some "Stark" trees at Aylesford, and on 28th May living ones were discovered there. In consequence, all trees of 1910, 1911 and 1912 planting throughout western Nova Scotia were examined between 5th June and 1st Nov., and the infected trees, which were confined to Hants, King's, Annapolis, Digby and Yarmouth Counties, were destroyed. The first scales were found moving on the trees about 10th July; they were very abundant on them in the middle of the month and were moving as late as August. The average period for Ontario, on the other hand, is between 10th and 30th June.

ROSS (W. A.). **Recent Work on the Apple Maggot in Ontario.**—*Ann. Report Entom. Soc. of Ontario, Toronto*, 1913, pp. 67-72.

During experiments carried on at Bowmanville, adults of *Rhagoletis pomonella* emerged from the first week of July to the middle of September, but no laying was observed till the third week in July. The minimum period of incubation was 4¾ days, the average 6, the maximum 9. The author gives elaborate details with regard to the baits, repellants, sprays, soil fumigants, burying of pupae and shallow cultivation, but the net result of data collected during two years is that nothing is really effective except the collection of fallen fruit, which will free an orchard if summer apples are picked up every other day, autumn and early winter varieties every second week, and winter varieties every third week. Poultry were found to free marked portions of ground from pupae placed in it. In a list of over thirty varieties of apples none was exempt, but the acid suffered much less than the sub-acid and sweet kinds. Seedling trees were much infested, even in the case of crab-apples, and in St. Anne's, Que., larvae and pupae were secured from haws. In Ontario the pest occurs in Prince Edward, Hastings, Frontenac, Northumberland, Durham, Ontario, Wentworth, Lincoln, Welland, Norfolk, and Carlton Counties.

PETCH (C. E.). **Insects of Quebec for the Year 1912.** *Ann. Report Entom. Soc. of Ontario, Toronto*, 1913, pp. 72-75, 3 figs.

*Malacosoma americana* (American Tent Caterpillar) and *M. disstria* (Forest Tent Caterpillar) entirely defoliated many unsprayed orchards. *Galleria mellonella* (Larger Wax-moth) and *Achroia grisella* (Lesser Wax-moth) entirely destroyed the combs in some twenty beehives. *Eulecanium nigrofasciatum* (Terrapin Scale) badly infested plum and birch. *Lepidosaphes ulmi* (Oystershell Scale) was very plentiful on apples and plums, and *Aphis pomi* (Green Aphis) on nursery stock and suckers. Buffalo

Tree Hoppers, Snowy Tree Crickets, Blister Beetles and Flea-beetles were fairly common, but Grasshoppers and Potato Beetles were not. *Saperda candida* and *Chrysobothris femorata* (Apple-tree Borers), like *Tischeria malifoliella*, were very prevalent in some orchards. *Typhlocyba comes* (Grapevine Leaf-hopper) very early stripped grape vines and Virginia creeper of the greater part of their foliage; PENTATOMIDAE (Stink Bugs) were common, as also *Lygus pratensis* (Tarnished Plant Bug), especially in the hoed crops, late in the season. *Conotrachelus nenuphar* (Plum Curculio) and *Anthonomus quadrigibbus* (Apple Curculio) were very injurious. The latter is worse near Covey Hill, and in Chateauguay Basin it was very injurious to early apples. Its egg-punctures produce hard green cores penetrating nearly to the centre, distorting the fruit and spoiling it both for eating and cooking. The adults feed first on the early varieties. This year they began with the first week in August, reached their maximum in the second and third, and continued until 3rd Sept. Lights, tanglefoot and poisoned baits were of no avail, but spraying with lime-sulphur or Bordeaux mixture greatly lessened the injury, and an orchard cultivated, pruned and properly sprayed, though previously much infested and though surrounded by others in which the pest abounded, was entirely freed from it.

CAESAR (L.). **Insects of the Season in Ontario.**—*Ann. Rept. Entom. Soc. of Ontario, Toronto*, 1913, pp. 75-84, 10 figs.

Codling Moth was less abundant, partly because the wet, cold season must have lessened the percentage of the second brood and also because thorough drenching of the bloom with spray has given very satisfactory results. *Enarmonia prunivora* (Lesser Apple Worm) abounds in haws, and this year attacked apples at Guelph and in the Niagara District, and some cherries at St. Catharine's. *Conotrachelus nenuphar* (Plum Curculio) did much damage to cherries, plums, peaches, pears and, especially in the Niagara District, to apricots. In the autumn there was less of it than usual on the apples. *Anthonomus quadrigibbus* (Apple Curculio) was not frequent on apples. *Eucosma (Tmetocera) ocellana* (Bud Moth) seldom troubled well sprayed orchards. A normal number is expected the following spring. *Coleophora fletcherella* and *C. malivorella* (case-bearers) and *Dichomeris ligulella* (*Ypsolophus pomotellus*) (Palmer Worm) were less numerous than usual. *Malocosoma americana* (American Tent Caterpillar) has increased abnormally in the eastern half of Ontario alone, especially east of Toronto and of Brighton. Orchards sprayed with lime-sulphur before the buds burst and with lime-sulphur and lead arsenate before the blossoms did so, were almost entirely free from nests and larvae. *Alsophila pometaria* (Fall Canker-Worm) was much more destructive than usual at Dundas, Stoney Creek and some other districts. Spraying before the blossoms burst was found to clear a badly infested orchard. The adults emerged about 11th October. *Aphis sorbi* (the Rose Aphis) turned many leaves sickly and yellow on the lower apple branches in the Niagara District and

deformed much of the fruit. *Aphis avenae* was very destructive to nursery stock and young orchards in August and September. Ladybird beetles, their larvae, and other predaceous insects were very helpful against them, and Hymenoptera parasitised about 50 per cent. of *Myzus ribis* (Currant Aphis), which did much damage. *Myzus persicae* (Peach Aphis) appeared in small numbers early in June and *Schizoneura lanigera* (Woolly Aphis) was also not unusually abundant. Experiments showed "Black Leaf 40," with lime-sulphur, to be fatal to Aphids, but the remedy is unfortunately expensive. *Aspidiotus perniciosus* (San José Scale), which appeared near Woodstock, was combated by spraying with lime-sulphur. *Eriophyes pyri* (Blister Mite) was successfully treated by spraying before the buds burst, on 25th April, and the same result was obtained on 6th May, after they had done so. *Bryobia pratensis* (Brown Mite) had turned plum leaves in Niagara District a dull grey at the end of August, while *Tetranychus bimaculatus* (Red Spider) had done much injury to currant leaves. *Rhagoletis cingulata* and *R. fausta* (Cherry Fruit Flies) did much damage to Montmorency cherries, and in certain orchards between Lake Ontario and Beamsville. *Macrodactylus subspinosus* (Rose Chafer) was equally destructive on grapes, raspberries and young cherry trees. *Eriocampoides limacina* (Pear and Cherry Slug) was less common than usual; it chiefly attacked young cherry trees. *Typhlocyba comes* (Grapevine Leaf-hopper) was less destructive than last year; *Janus integer* (Currant Stem-girdler) appeared in small numbers at Fruitland, *Aegeria tipuliformis* (Imported Currant Borer) attacked a large number of canes, *Haltica chalybea* (Grapevine Flea-beetle), of which the larvae were found on wild grape leaves in June, badly infested several vineyards in the Niagara District, where *Bembecia marginata* (Raspberry Root-borer) has taken possession of old raspberry plantations. *Anthonomus signatus* (Strawberry Weevil) was doing injury in Brant County, and *Metallus rubi* (Blackberry Leaf-miner) was abundant in parts of the Niagara District. This does no damage till the middle of July, when the forming fruit is well advanced. The larva hibernates in a round earthen case about 5 mm. in diameter, difficult to break. Spraying with kerosene emulsion seems useless, and the author suggests removing the earth in spring from under the bushes, to the depth of about two inches, and following this by frequent cultivation. Cutworms, except the red-backed variety at Burlington, have been rare, as also *Pegomyia brassicae* and *P. cepetorum* (Cabbage and Onion Maggots), *Diabrotica vittata* (Striped Cucumber Beetle), *Crioceris asparagi* and *C. 12-punctata* (Asparagus Beetles) at Guelph. *Leptinotarsa decemlineata* (Colorado Beetle) has been kept within bounds by *Perillus bioculatus* var. *claudus*, but was quite common at Guelph and in other parts of Western Ontario, and as far east as eight miles from Ottawa. The larvae of white grubs and wireworms have done much injury to grain crops and potatoes, especially in Western Ontario. *Mayetiola destructor* (Hessian Fly) has been unusually noxious in certain districts, as were also grasshoppers, especially in parts of Norfolk County.

CAESAR (L.). **Some new or unrecorded Ontario Insect Pests.**—*Ann. Report Entom. Soc. of Ontario, Toronto*, 1913, pp. 100-105, 7 figs.

After observing that *Rhagoletis cingulata*, seen on cherry trees near St. Catharine's on 22nd June, had not oviposited, the author discovered a number of *R. fausta* (Black-bodied Cherry Fruit Fly) on some other trees. The two species were subsequently found to attack cherry trees in about equal proportions, at Grimsby as well as St. Catharine's, and it is therefore probable that *fausta* may have done much damage attributed to *cingulata*. Nymphs of *Neurocolpus nubilus* and *Paracalocoris colon* were found on apples at Hamilton, a week or so after the blossoms had fallen, feeding on the fruit and producing depressions where they had done so. *Lygidea mendax* nymphs were also seen on 12th June, not in the fruit, but on the shoots growing from the crown of the trees.

SAUNDERS (W.). **An Invasion of Cotton Moths.**—*Ann. Report Entom. Soc. of Ontario, Toronto*, 1913, pp. 84-85.

The author states that great swarms of *Alabama argillacea*, Hb. appeared about the station lights of London, Ont., on 12th October last year, and similar swarms of tens of thousands fluttering about each arc light had been noticed on the 6th at Clinton, New York. The moths disappeared after a few days.

LOCKHEAD (Wm.). **Injurious Insects of Quebec in 1912.**—*Ann. Report Entom. Soc. of Ontario, Toronto*, 1913, pp. 85-86, 4 figs.

*Eucosma (Tmetocera) ocellana* (Bud Moth) was very abundant on the Island of Montreal; *Aphis mali* (Apple Plant Louse) did considerable damage on young trees; many larvae of the Clover-root Borer were observed on old red clover plants at Macdonald College, Quebec, where the Clover-leaf Midge was abundant on white clover leaves; the Striped Cucumber Beetle was destructive to squashes; the punctures of Raspberry-cane Borers wilted many canes in July; many Currant Saw-fly larvae were on currant bushes in June and July, and the Currant Aphis was abundant and greatly damaged the leaves.

SWAINE (J. M.). **Notes on some Forest Insects of 1912.**—*Ann. Report Entom. Soc. of Ontario, Toronto*, 1913, pp. 87-92.

During the discussion on this paper Dr. Hewitt, commenting upon the author's allusion to *Mesoleius tenthredinis* as an enemy of the Larch Saw-fly, suggested that parasitised cocoons should be collected and taken to places where an outbreak was beginning, so as to control it from the outset. In the course of his survey the author mentioned the diminution of the Spruce Budworm in Quebec; the defoliation in Algonquin Park of white spruces by *Lophyrus abietis*; the control of *Chermes similis* and *C. abietis* on shade trees by sprays of kerosene emulsion or whale-oil soap and by burning the galls from small trees; the serious

injury done to small white pines in eastern Canada by *C. pinicorticis*; the abundance at Ottawa on European and American larches of *C. strobilobius* and *Coleophora laricella*; the attacks upon spruce and pine of *Pissodes* in the Rocky Mountain and Riding Mountain forest reserves, respectively in Alberta and Manitoba; the abundance of destructive bark-beetles in the latter reserve, where, about Clear Lake, the dying bark of spruce, pine and larch in fire areas was attacked by *D. murrayanae*, Hopk., *D. simplex*, Lec., *Ips peturbatus*, Eichh, *I. caelatus*, Eichh., and *Polygraphus rufipennis*, Kirby; the driving of round tunnels by *Trypodendron retusus*, Lec., in poplar and *T. lineatus*, Ratz., in spruce and pine, with the introduction into the wood of the fungi and bacteria on the bark scraped by deer; the injury done to Douglas Fir in British Columbia by *Dendroctonus pseudotsugae*, Hopk., and to healthy *Pinus ponderosa* by *D. brevicomis*, Lec., *D. ponderosae*, Hopk., and other bark-beetles; the destruction of healthy white spruce in Eastern Canada by *D. valens*, Lec., which, like *Ips calligraphus* and many kinds of *Ips*, *Dryocoetes*, *Trypodendron*, *Gnathotrichus*, *Polygraphus*, *Hylurgops*, *Pityophthorus*, *Pityogenes* and others, occurs in myriads in pine and spruce slash of last winter's cuttings; as long as extensive cutting continues there is probably little danger from any species discovered there this summer, but when cutting ceases, as it soon must, the second growth pine spruce will be in danger; the boring by *Pityophthorus* of white and red pine twigs, which, like those of other ornamental trees attacked, should be burned; the injury done about Port Arthur, Ontario, by *Bucculatrix canadensisella*, Chamb., and the outbreak there in summer, on the bark of twigs and branches of sound pine trees, of *Monohammus scutellatus*; the abundance at Ottawa of larvae of *Paralechia pinifoliella*, Clem., in the leaves of *Pinus banksiana*; the breaking of thousands of oak branches in the St. Lawrence Island parks by *Elaphidion villosum*; the destruction of imported white birches about Ottawa by *Agrilus anxius*, and of poplar in the east and in Manitoba by *Saperda calcarata*. This last, which infests the trunk and larger branches, has been taken from the heart of the largest balsam poplars. The borers should be removed in the autumn and the older larvae should be extracted with a knife, or benzine or carbon bisulphide should be injected into the borings.

CAESAR (L.). **Arsenite of Zinc as a Substitute for Arsenate of Lead.** —*Ann. Report Entom. Soc. of Ontario, Toronto*, 1913, pp. 111-112.

The experiments made by the author show that trees sprayed with zinc arsenite were slightly more free from Codling Moth than those in which lead arsenate had been used; that both poisons were found of equal efficacy against Potato Beetles; and that in no case, whether combined with lime-sulphur or Bordeaux mixture, did zinc arsenite burn the plants. Being a fine powder, it is easier than lead arsenate to store, to pour, mixed with water in a pail, into the tank, and to keep in suspension in water. It costs two-thirds as much as the other, but is somewhat inferior to it in sticking qualities.

## Notices concerning British Official Entomologists.

We are advised that the present distribution of the staff of the Union Division of Entomology, South Africa, is as follows:—

The headquarters are in Pretoria, a branch office is maintained at Cape Town, and a field station is located at New Hanover, Natal, for the investigation of insects attacking wattle (*Acacia mollissima*) only.

*Head Office Staff.*—Chas. P. Lounsbury (Chief of Division), Claude Fuller (Assistant Chief), C. P. van der Merwe (Entomologist in Charge of Nursery Inspection), F. Thomsen and Albert Kelly (Assistant Entomologists). Postal address: P.O. Box 513, Pretoria.

*Cape Branch.*—C. W. Mally (Cape Entomologist).

*New Hanover Station.*—C. B. Hardenberg (Entomologist in Charge), G. C. Haines (Assistant Entomologist).

Dr. C. Gordon Hewitt, Dominion Entomologist for Canada, left Ottawa at the beginning of September to inspect the work of the field laboratories of the Division of Entomology in the western provinces, and also the new plant quarantine station in southern Saskatchewan. He then proceeded to California to enquire into the entomological and quarantine work on the Pacific coast and returned by way of Utah, where the control of the alfalfa weevil, a possible Canadian pest, was investigated.

Mr. E. Ballard, Government Entomologist for Nyasaland, will shortly be leaving that Protectorate, having been appointed as Entomologist to the Government of Madras.

CHASSIOTIS (S.). **La Viticulture en Grèce.** [Vine cultivation in Greece.]—*La Vie Agricole et Rurale*, ii, no. 41, Paris, 13th Sept. 1913, pp. 378-380.

The author states that *Phylloxera* does not attack the Greek vineyards, but is met with in the recently conquered provinces. *Polychrosis*, *Clysia*, and occasionally *Pyralis*, do great damage, especially to currants, the caterpillars being protected by the thickness of the clusters. *Otiorrhynchus* is often very abundant in light soils, and locusts sometimes devastate certain districts.

VUILLET (A.). **La Pyrale du Mais** (*Pyrausta nubilalis*, **Hb.**). [The Maize Pyralis, *P. nubilalis*, Hb.] *La Revue de Phytopathologie Appliquée*, *Paris*, i, no. 8, 20th Sept. 1913, pp. 105-107, 1 fig.

The author says that in the south-west of France the cultivation of maize is of considerable economic importance, and the crop is unfortunately attacked by a number of pests, both fungi and insects, which occasionally reduce the harvest materially. The caterpillars of *Chloridea obsoleta* and *Laphygma exigua* and others and especially those of *Pyrausta (Botys) nubilalis* are said to be its chief enemies. The injury done by *P. nubilalis* is frequently small and passes unnoticed, but at times is serious, though the growers generally attribute the damage to some entirely different cause, and the author thinks that it is important to draw attention to the existence of this pest and the possible damage which it may cause for this reason.

The insect is known in France as the "pyrale du mais" and in Germany as "Hirsezünsler" or "Gliedwurm." The author describes the larva, chrysalis and perfect insect, and goes on to say that the caterpillar is a more or less omnivorous feeder and frequently damages hops, hemp and millet. The reed of Provence (*Arundo donax*), *Setaria viridis* and other graminaceous plants, *Artemisia vulgaris* (mugwort) and *Inula squarrosa* are also attacked, and Dr. Lafaury reports having found the larvae in the pods of haricot beans and in large oak galls.

The moths fly by night during the month of June. The female lays her eggs singly on the twigs or branches of the food-plants and in the Graminaceae generally on a leaf-sheath near to a knot. The eggs hatch about 14 days after laying and the young larva immediately penetrates into the interior of the stalk and commences boring a gallery in the medullary tissue, sometimes downwards, but more generally upwards, with the result that those parts of the plant above the point of attack begin to turn yellow and finally dry up prematurely, if not previously broken by the wind. In the case of maize, the caterpillars penetrate into the cob and may even gnaw the grains from within outwards, thus destroying the crop directly. The point of attack is generally at the upper internodes immediately below the spike. The presence of the larva can be detected by the excrement which is

pushed out from the point of entry. When the larva is full-grown it descends towards the lower part of the plant near to its point of emergence from the soil or above, and, in the case of maize, as far as the roots, and there it winters. In the May following it weaves a cocoon and pupates.

It would appear that *P. nubilalis* has few or no parasites. J. Fallon in 1880 raised a large number of the species without being able to obtain either a Dipteron or a Hymenopteron. Jablonowski has however noted in Hungary a Tachinid (*Ceromasia interrupta*, Rond.) which attacks it. The author recommends against the pest the use of lamp traps in the month of June and says that these lamps should be placed at a considerable distance from the fields which it is sought to protect. After the end of July he advises that the fields should be carefully examined and all plants which present any signs of attack should be cut at the next knot below the point of entry, as in this way the attack can be at least minimised. The author experimented on a number of plants by blocking the entrance of the gallery with tar applied by means of a brush, but found it useless. He says it is very necessary to pull up and destroy before spring all stems remaining on the field after harvest, as it is practically certain that most of these will contain a hibernating caterpillar. The food-plants named should also be sought for in waste land around the maize fields and carefully destroyed.

TSCHAEN (E.). **La Noctuelle de l'Artichaut** (*Gortyna ochracea*, **Hübner**). [The Artichoke Noctuid.]—*La Revue de Phytopathologie Appliquée, Paris*, i, no. 8, 20th Sept. 1913, pp. 107-108, 2 figs.

The artichoke in the neighbourhood of Hyères are said to have been seriously attacked this year by the larvae of *Pyrameis cardui*, L., and *Gortyna ochracea*, Hb., both insects being frequently found upon the same plant. In some seasons the damage is small and exceedingly local, but in the present year the invasion has been serious, and the two species appear to have done about equal damage. The author describes the perfect insect, caterpillar and chrysalis of *G. ochracea*, which is well known as a pest of the artichoke in Algeria and the South of France.

Amongst the host plants of the caterpillar the author mentions *Sambucus ebulus* (ground elder), *Lappa communis* (burdock), *Valerina officinalis* (valerian), cardoons, *Verbascum thapsus* (Aaron's Rod), *Digitalis purpurea* (foxglove) and others sufficient to show that the larva is more or less omnivorous. It has also been damaging potatoes in Germany and in England, and hops in Bohemia. On the artichoke, the larva of this Noctuid lives in the floral branches, and a minute opening blocked by a small lump of excrement in the axil of each leaf or of each branch marks its presence. These branches present galleries 7-8 mm. in diameter which extend from the neck to the capitulum. One or two, but rarely more, larvae are found in

each gallery. Frequently the gallery is bored throughout the whole length of the floral stem before the capitulum is attacked: in this case all the other heads on this stem fail to develop and in this way it is possible for a single larva to destroy the fruit of a whole plant. About the middle of May the larva passes downwards to the roots and pupates at the end of August or in the early days of September.

According to the reports received from different districts the adults of the second brood generally appear during the summer from the end of July and even into October, and the eggs are laid on the base of the food-plants. A certain number of caterpillars and pupae hibernate and emerge in the following spring.

According to Gilmer, earwigs frequently pentrate into the galleries and destroy a considerable number of pupae. The larva is also parasitised by *Ichneumon sanguinatorius*, Grav. The author says that it is obvious from the mode of attack that insecticides are of little value against this pest, though possibly if used just before the hatching of the eggs they might be of some service, but he considers that it is more important to determine with care the date of the various flights of the perfect insect (he is at present engaged on observations to determine this) and to take measures accordingly. He suggests that trap lamps might be of some use in destroying a certain number of the moths, but that unless carried out on a considerable scale and embracing an area considerably beyond that of the crops sought to be protected, it would not be of any very real value. He suggests that care should be taken to destroy all plants which may contain larvae or pupae and in doing this to bear in mind the omnivorous character of the larvae.

VUILLET (A.). **Un Lépidoptère nuisible aux Pois.** [A lepidopterous pest of peas.]—*La Revue de Phytopathologie Appliquée, Paris*, i, no. 8, 20th Sept. 1913, pp. 110.

The author says that peas are frequently attacked by the caterpillars of Microlepidoptera and most frequently perhaps by those of *Grapholitha nigricana*, Steph. He has now observed in the department of Gers, at Ornezan, a field of peas seriously attacked by the larvae of a butterfly, *Lampides baetica*, L. This insect is widely distributed over the whole of southern and central Europe, the Canary Islands, Africa, Madagascar, Western and Central Asia and Australia. In France it is chiefly found in the centre and south-west, but it has also been met with in Brittany. The caterpillar will apparently feed upon the pods of most leguminous plants and especially upon *Colutea arborescens* (bladder-senna), *Medicago sativa* (lucerne), *Ulex europaeus* (furze), *Genista*, *Sarothamnus scoparius* (broom), and Green places it amongst the pests of *Crotalaria* in Ceylon. According to some authors pupation also takes place within the fruit, but the author after an examination of a large number of infested pods found no pupae, and in the insectary pupation took place upon the earth. Nothing of the nature of symbiosis with ants was observed.

In Europe there are two broods of this species, which ... between June and October, and the author is of opinion that on 8th August, when he commenced his observations, the majority of the larvae had already quitted the pods to pupate. Of the caterpillars collected on that date two began to pupate on the 14th and 15th and the insects emerged on the 26th and 27th August. He says that until further knowledge of the life-history of the insect has been obtained it is impossible to suggest any rational method of meeting its attack.

CRIDDLE (N.). **Insect Pests of Southern Manitoba during 1912.** *Ann. Report Entom Soc. of Ontario, Toronto*, 1913, pp. 97-100.

The author introduces his list by the remark that in Saskatchewan and Alberta, as well as in Manitoba, the planting of cereals has enormously increased the food of insects which formerly had only a few grasses to live on, and that their consequent multiplication demands great vigilance. A few Hessian Fly larvae were discovered late in June, pupae on 13th July and the imago on 6th September; adults of the Greater Wheat-stem Maggot, more frequent on grasses than grain, were met with from May to mid-September. *Oscinis carbonaria* killed numbers of spring wheat plants, the larvae being plentiful in June and July, and adults emerged on 19th to 27th July from pupae collected on the 13th, promising a third brood before winter. *Cephus occidentalis*, which attacked wheat and rye throughout the Province, the damage diminishing towards the centre of fields, should be met by ploughing at least six inches deep in autumn or in spring, with subsequent packing. An outbreak of *Melanoplus atlantis, packardi, angustipennis, bivittatus, femur-rubrum, dawsoni* and other grasshoppers took place in June and early July, when they attacked the heads of all kinds of grain, but they were kept down by horse-droppings, salt and Paris green. Wet weather impeded their distribution before breeding, killed and weakened many, and assisted the assaults of *Empusa grylli* upon them; but in spite of all this they deposited large quantities of egg-masses, which threatened an outbreak, though less severe, in the following May. Colorado beetles were increasing, and attacked flowering species of *Nicotiana* as well as potatoes. The latter also suffered from *Macrobasis unicolor* var. *murina*, which normally lives on wild peas, vetch and loco weed. *Entomoscelis adonidis*, which had increased, attacked Virginian stock and turnips; root-maggots, cutworms, and the cabbage-fly had become rare, but *Pieris protodice* was common. The Larch Saw-fly disappeared earlier than usual, possibly being attacked by fungus, but *Lophyrus abietis* defoliated many spruces. These flies emerge in August, lay, and die before winter. The larvae hatch in June, and by the middle of July they are all fully developed and spin cocoons on the leaves or under the branches, not under dead leaves or moss on the ground. *Saperda calcarata*, which destroys the poplar groves, should be dealt with by burning the attacked trees.

TREHERNE (R. C.). **Notes on Injurious Insects in British Columbia in 1912.**—*Ann. Report Entom. Soc. of Ontario, Toronto*, 1913, pp. 106-111, 1 fig.

The author chronicles the abundance of *Tmetocera ocellana* in the Lower Fraser Valley; where *Ludius suckleyi*, and another Elaterid beetle, which seemed to be *Limonius discoideus*, devoured apple buds and blossoms; *Magdalis aenescens* attacked dead bark tissues; *Aphis sorbi*, which spends the autumn, winter and spring on the apple trees and migrates to an unknown host in summer, deformed the fruit and hindered its development; *Aegeria albiformis* was commonly found; *Bryobia* and *Tetranychus* are present; and *Otiorrhynchus ovatus* was the most serious pest in the district [see this Review, Ser. A, i, pp. 92-94]. In the Fraser Valley *Malacosoma erosa*, west of the Cascade Range, did much damage to all but pear trees. *M. pluvialis*, also excepting the pear from its general attack, was commonly found in the interior, and *M. constricta*, an assailant of the oak and the prune, in the Pacific Coast States. On the Coast the Oyster-shell Scale combined with *M. erosa* to kill many wild crab-apples. *Eriosoma lanigera* was widespread in the Fraser Valley; *Syneta albida* was eating young developing apples and maturing cherries; the Pear Tree Blister Mite was in every orchard; both broods of the Pear Tree Slug, like *Myzus cerasi* and the Green Apple Aphis, merely checked excessive vegetation; and a slight infestation of the Lesser Apple Worm took place at picking time, especially on Crab, Spy, Gravenstein and King apples. *Corymbites inflatus* destroyed buds and blossoms of young apple trees in the Okanagan District; bud weevils affected apple buds. There was an outbreak of *Vanessa californica* in the Kootenay country; where, as in the Nelson District, a climbing cutworm gave much trouble, and despite the Paris green used against it in bran mixture, killed a number of young apple trees by girdling. Carbolic emulsion, applied early, has proved useful against the Cabbage Maggot in Vancouver. Elaterid larvae were working on potato tubers at Mission, and *Epochra canadensis* was attacking currants and gooseberries in Grand Prairie, as well as throughout the Western States and British Columbia. The author expects the San José Scale and the Codling Moth, the latter of which made a temporary appearance at Armstrong and was got rid of by the boiling of all the apples in the place, to invade British Columbia along the Okanagan Valley, and *Leptinotarsa decemlineata* from the Columbia River Valley, where it has reached Metaline Falls from Nez Percé, in Idaho.

MORSTATT (H.). **Liste schädlicher Insekten.** [List of noxious insects (in German E. Africa).]—*Der Pflanzer, Daressalam*, ix, no. 6, June 1913, pp. 288-296.

In addition to various pantophagous ACRIDIIDAE and wood-boring APIDAE the following is a list of injurious insects recorded in German East Africa:—

ORTHOPTERA: *Mataeus orientalis*, Karsch—Ficus elastica; *Conocephalus nitidulus*, Scop.—sorghum, rice; *Madica verrucifera*,

Karsch—sisal: *Gryllotalpa africana*—herbaceous crops; *Gryllus* sp.—Ceara rubber, vegetables.

Isoptera: *Coptotermes amanii*, Sjöst., *Eutermes usambarensis*, Sjöst.—timber in buildings; *Termes natalensis*, Hav.—rubber trees; *Termes badius*, Hav.—coffee.

Coleoptera: *Oryctes monoceros*, Ol., *O. boas*, F., *O. cristatus*, Snell, *Temnorrhynchus usambaricus*, Kolbe, *Tetralobus flabellicornis*, L., *Doralandra frumenti*, F., *Rhynchophorus phoenicis*, F.—coconut.

*Popillia hilaris*, Kr., *Epilachna polymorpha*, Gerst., *E. matronula*, Wse., *E. similis*, Thb., *Syagrus puncticollis*, Lef., *Dicasticus gerstaeckeri* Fst., *Epipedosoma laticolle*, Klb., *Systates pollinosus*, Gerst., *Apion xanthostylum*, Wgn., *Alcides brevirostris*, Boh.—cotton.

*Trogosita mauritanica*, L., *Silvanus surinamensis*, F., *Laemophloeus pusillus*, Schh., *Tribolium castaneum*, Hbst., *T. confusum*, Duv., *Calandra oryzae*, L.—seeds and stores.

*Epilachna polymorpha*, Gerst., *E. matronula*, Wse., *E. similis*, Thb., *E. fulvosignata*, Reiche, *Lagria villosa*, F., *Callispa kilimana*, Klb., *Oides collaris*, Baly, *Hispa striaticollis*, F., *Systates pollinosus*, Gerst.—maize.

*Idacantha magna*, Wse., *Anthores leuconotus*, Pasc., *Nitocris usambica*, Klb., *Anatragus ornatus*, Klb., *Frea marmorata*, Gerst., *Coptops aedificator*, F., *Pentommus pauper*, Klb., *Pachydissus hector*, Klb., *Ceroplesis adspersa*, Pasc., *C. conradti*, Klb., *Araeocerus fasciculatus*, de G., *Phloeobius catenatus*, Klb., *P. pustulosus*, Gerst., *Dicasticus gerstaeckeri*, Fst., *Systates pollinosus*, Gerst., *S. irregularis*, Fst., *Rhadinoscapus nocturnus*, Klb., *Xyleborus morstatti*, Haged., *X. aulmanni*, Haged.—coffee.

*Lagria villosa*, F., *Ceralces ferrugineus*, Gerst., *Oides collaris*, Baly, *Inesida leprosa*, F., *Sternotomis bohemani*, Chev., *Mallodon downesi*, Hope, *Systates irregularis*, Fst., *Polyrhabdotus transversalis*, Fst.—rubber.

*Popillia hilaris*, Kr.—wattle: *Epilachna canina*, F., *E. chrysomelina*, *Ootheca mutabilis*, Sahlb.—sesamum; *Phonapate porrecta*, Lesne—African mahogany: *Bruchus sinensis*, L., *B. ornatus*, Boh., *Araeocerus fasciculatus*, de G., *Apion cacaoi*, Wgn., *Apion fuliginosum*, Wgn.—cowpea: *Bruchus ornatus*, Boh.—Dolichos lablab: *Apion varium*, Wgn., *Ootheca mutabilis*, Sahlb.—beans; *Epilachna chrysomelina*, F.—Cucurbitaceae: *Mylabris amplectens*, Gerst., *M. difurca*, Gerst.—vegetables: *Colasposoma compactum*, Gerst.—sisal; *Diastocera reticulata*, Thoms.—kapok: *Tragocephala pretiosa*, Hintz., *Dicasticus gerstaeckeri*, Fst.—camphor: *Polyrhabdotus transversalis*—cacao; *Mecostylus vittaticollis*, Fst.—coca: *Systates irregularis*, Fst.—cinchona; *Cryptorrhynchus mangiferae*, F.—mango.

Lepidoptera: *Lycaenesthes* sp., *Miresa* sp., *Thliptoceras octoguttale*, Fld., *Cemiostoma coffeellum*, Staint., *Gracilaria* sp., *Agrotis* sp.—coffee.

*Prodenia* sp., *Earias insulana*, Boisd., *Agrotis* sp., *Chaerocampa celerio*, L., *Sylepta derogata*, F., *Gelechia gossypiella*, Saund., *Pyroderces simplex*, Wlsm., *Gracilaria* sp.—cotton.

*Euxanthe* (?) *drypope*, Cram.—castor: *Papilio demodocus*, Esp.—maize: *Busseola sorghicida*, Thur., *Diatraea orichalcociliella*, Str., *Sitotroga cerealella*, Ol.—sorghum: *Deudorix antalus*, Hopf., *Mussidia melanoneura*, Regel, *Eucosma* sp., *Sitotroga cerealella*, Ol.—beans: *Amphicallia tigris*, Butl., *Ephestia figulilella*, Gregs., *E. cahiritella*, Z., *Setomorpha insectella*—maize; *Deilephila nerii*, L.—cinchona: *Glyphodes ocellata*, Hmp.—Kickxia rubber: *Leucinodes orbonalis*, Gn.—egg-plant: *Plutella maculipennis*, Curt.—cabbages.

DIPTERA: *Dacus cucumarius*, Sack, *D. brevistylus*, Bezzi, *D. vertebratus*, Loew—Cucurbitaceae; *Ceratitis anonae*, Grah.—cacao: *Oscinella coffeae*—coffee.

RHYNCHOTA: *Antestia variegata*, Thb., *Cryptacrus comes*, F., *Caloden bohemani*, Stal, *Sphaerocoris annulatus*, F., *Serinetha leucophthalma*, Thb., *Aphis coffeae*, Nietn., *Ceroplastes ceriferus*, And., *Lecanium viride*, Green, *Lecanium hesperidum*, L., *Asterolecanium coffeae*, Newst.—coffee.

*Caloden apicalis*, Schout., *C. dregii*, Germ., *Serinetha leucophthalma*, Thb., *Oxycarenus hyalinipennis*, Costa, *Dysdercus nigrofasciatus*, Sign., *D. nigrofasciatus*, Stal, *D. superstitiosus*, F., *D. cardinalis*, Gerst., *D. festivus*, Gerst., *Helopeltis bergrothi*, Reut., *Chlorita facialis*, Jac., *Pseudococcus filamentosus*, Ckll., *Hemichionaspis minor*, Mask.—cotton.

*Stigmatococcus zimmermanni*, Newst., *Pseudococcus adonidum*, L., *Lecanium nigrum*, Nietn., *Aspidiotus destructor*, Sign., *A. transparens*, Green, *Selenaspidus articulatus*, Morg.—rubber.

*Lygus trabeatus*, Guer., *L. cuspidatus*, Kr.—cinchona: *Aphis cracivora*, L.—cowpea: *Aphis sorghi*, Theo.—sorghum: *Phacosema zimmermanni*—African mahogany: *Lepidosaphes beckii*, Newm., *Pseudaonidia trilobitiformis*, Green—citrus spp.: *Chrysomphalus aurantii*, L., *Aspidiotus cyanophylli*, Sign.—sisal, coconut: *A. destructor*, *A. transparens*, Green—coconut: *A. cyanophylli*, *A. destructor*—camphor: *Chrysomphalus aurantii*—tea: *Selenaspidus articulatus*, Morg.—date palm: *Pseudococcus filamentosus*, Ckll.—mango: *P. citri*—potatoes.

FEYTAUD (J.). **Cochylis et Eudémis: procédés de capture des papillons.** [Cochylis and Eudemis: methods of capturing the moths.]—*Bull. Soc. d'Etude et de Vulgar. de la Zool. Agric., Bordeaux*, nos. 2, 3 & 4, April, June & August 1913, pp. 33-41, 73-83, 97-104, 14 figs.

This paper should be read in connection with those of Dr. Dewitz and M. Marchal [*Cf.* this Review, i, Ser. A, pp. 5-10 and 70-73]. It begins with a statement as to the flights of *Clysia ambiguella* (*Cochylis*) and *Polychrosis botrana* (*Eudemis*), the former of which take place in May and July, the latter in May, July and September; in both cases the moths fly irregularly and low, following the direction of the vine rows and the flight lasts several weeks. A description of the various forms of sticky racquets in use is given, followed by that of an improvement upon them, consisting of a stretcher (brancard Bourchanin)

having on either side of the poles two panels of wire gauze, roofed above with the same material and so put together that when the stretcher is set down between two rows of vines, each of these is enclosed, above and along its sides, by the panels. Willow wands are then used to scare the moths from the vines, and they are caught on the panels, the inner surface having been smeared with the customary sticky substances. Larvae are often carried into the vineyard buildings during the vintage, and when the moths emerge they are caught by means of sticky paper pasted on the windows.

The author states that light ceases to attract these moths when it exceeds about 5-candle power. This is one reason why they avoid strong sunlight, which also carries with it more heat than they can bear and deprives them of the moisture necessary to their existence. On the other hand *Clysia* moths fly to lamps when the air is cool and damp, and M. Feytaud briefly describes several kinds: oil, petroleum and candle lanterns, set in a deep dish or over a smeared tray perched at the top of a pole or hanging from it, acetylene burners set in the middle of a large pan, and electric lamps hung over a dish partly filled with water and petroleum. It appears from the particulars given that, though electricity is cheap to work and its use can be regulated to a nicety, its primary cost is considerable, so that, like acetylene, it is practically beyond the means of the agriculturist. The proportion of females attracted by lamps and of those present in the vineyard has been found by several observers to be much the same (generally about 40 per cent., the bulk of which had not ceased laying), except on stormy nights, when the few insects taken were all males. As regards *Polychrosis*, which is affected by smell rather than colour, the author describes the results obtained by baits in the Gironde and the material to be chosen for the vessels used [*Cf.* this Review, Ser. A, i, pp. 9, 10], adding that these vessels should be shaped much like pails, since evaporation is too rapid in flat ones, that they should be enamelled inside, and that their efficacy is greatly increased by hanging them about 15 cm. below cheap little roofs, made of tarred cardboard or earthenware and shaped like billiard lamp-shades. These coverings keep out the rain, which would stop fermentation and dilute the bait. A liquid equal to more expensive baits can be obtained by mixing 1 lb. of molasses with 10 gallons of water and adding 1 lb. of wine lees to hasten fermentation. The vessels should be hung at the same height as the bunches of grapes. Illustrations show various ways of distributing them, and the author suggests having one every 2 yards at the ends of the rows, one every 10 yards along the inner rows and one every 5 yards along the outer rows. The reason is that the pails outside are easier to inspect, while they are also those most frequented by the moths. The baits attract many insects, useful and otherwise, as well as *Polychrosis*. *Chrysopa vulgaris*, though very rare during the May flight, is frequently taken in July; and where fermentation has been allowed to cease in the vessels, or they have been set before the general flight of the vine-moths, *Chrysopa* is destroyed more often than *Polychrosis*. As in the case of *Clysia* the proportion of *Polychrosis* females caught, generally about

40 per cent., is the same as that of the insects flying among the vines, and the few captured in bad weather are chiefly males. These also predominate until the general flight, from which moment the females constantly increase till there are more of them than of males. Since there are hardly any but males at the beginning of the flight, and at the end the females have all laid, the most useful intermediate time for baiting, which does not exceed 15 or 20 days in certain years and 10 or 12 in others, can best be determined by the anatomical examination of specimens. The author, who gives a detailed estimate showing that the cost of baits is less than half that of lamps, goes on to say that it involves much less labour than the use of racquets. He concludes by stating that, though preventives and insecticides are really more effective, since they are less dependent upon weather conditions, capture is more popular among cultivators, both because it is easier of general application and because it produces more tangible results.

VAILE (R. S.). **A Tenebrionid Beetle injuring Beans.** *Mthly. Bull. State Comm. Hortic., Sacramento*, ii, no. 7, July 1913, p. 591.

Although known for some years in southern California, *Coniontis subpubescens* has never been reported as doing damage until this season, when the adult beetles were found in large numbers, near Oxnard, feeding on the tender stocks of beans just after they came through the ground. The stand of beans was almost entirely ruined, the damage being more severe than that done by *Blapstinus* sp.; but it is not expected that the pest will spread, as the fields are isolated, and the beetle is easily poisoned by cutworm baits.

SMITH (H. S.). **The introduction of *Calosoma* for use against the Oak Moth.**—*Mthly. Bull. State Comm. Hortic., Sacramento*, ii, no. 7, July 1913, p. 590.

The damage done by *Phryganidia californica* in its native State, and especially in the Santa Clara valley, had, during June 1913, often attained to complete defoliation of the oak trees, and much more was feared from the second brood. It was therefore decided to obtain a supply of *Calosoma sycophanta* from New England, where it had proved very successful against the gypsy moth. This large green beetle will find in California a climate similar to that of its native Southern Europe, and will have as its food, in addition to more than one generation of the oak worm, the fall web-worm, several species of tent caterpillars, several tussock moths, the canker worms and the red-humped caterpillars. The fact that the larvae of *C. sycophanta* are good tree-climbers enables them to reach the oak leaves which it would be almost impossible to spray.

COOK (A. J.). **Arsenate of Lead** *versus* **Paris Green.**—*Mthly. Bull. State Comm. Hortic., Sacramento,* ii no. 7, July 1913, pp. 590-591.

The soluble nature of Paris green and London purple often renders these substances injurious to leaves, and Gillette's remedy of mixing them with 4 or 5 to 1 of unslaked lime involved more work and was sometimes unsatisfactory. On the other hand arsenate of lead, even in the strength of 4 lb. to 100 gals. water, is harmless, while the powder can be mixed, pound for pound, with dry wood ashes. The powder should be applied with a dust gun in calm weather, when the plants are wet with dew.

ESSIG (E. O.). **The Branch and Twig Borer.**—*Mthly Bull. State Comm. Hortic., Sacramento,* ii, no. 7, July 1913, pp. 587-589, 1 fig.

The damage done by *Polycaon confertus*, Lec., consists in clean round burrows in the branches, extending into the pith or even through to the other side, the insects beginning in the axil of a bud or small branch and boring downwards. Small twigs are so weakened that their weight breaks them, and the tunnels in larger branches provide hibernating quarters for other pests and opportunities for the entrance of fungi and decay organisms. The damage is done by adults alone, which appear and disappear suddenly, in spring and early summer. It is supposed that they lay in live oak, in which adults have been reared from larvae, but from this native host they have already spread to the almond, apple, apricot, cherry, currant, fig, grape, olive, orange, peach and pear. The Californian counties in which it has been found, so far, are Alameda, Butte, Calaveras, Contra Costa, El Dorado, Napa, Riverside, Sacramento, Santa Clara, Santa Cruz, Tehama, Ventura and Yolo. Burning the infested twigs and destroying the insects in the burrows, by means of a short wire or knife blade, are the only remedies in use at present.

BRANIGAN (E. J.). **A New Host Plant of the California Grape-Root Worm.**—*Mthly. Bull. State Comm. Hortic., Sacramento,* ii, no. 7, July 1913, pp. 585-586.

During an investigation in the high Californian Sierras into the hibernating quarters of *Hippodamia convergens*, Guer., the author found the leaves and roots of *Saxifraga peltata*, Torr., greatly damaged by *Adoxus obscurus*, of which a few adults were discovered, in spite of the lateness of the season.

HARNED (R. W.). **Insects affecting Melons, Cucumbers and Squash.**—Press Circular, *Mississippi Agric. Experim. Station*, July 1913, 1 p.

The author enumerates, as insects that suck out the juices of the leaves and cause them to curl up and wilt, *Aphis gossypii*

and *Anasa tristis*, and, as feeding upon the tissues, *Diabrotica vittata*, *D. 12-punctata*, *Epilachna borealis*, *Melittia satyriniformis*, *Diaphana hyalineata*, and *D. nitidalis*. All vines and leaves of melons, "squashes" and cucumbers—the same insects attack all these plants—should be deeply ploughed under immediately after gathering the crop, and autumn and winter ploughing and harrowing helps to destroy the insects. Rotation of crops should take place annually, no cucurbits being planted in the neighbourhood meanwhile. Early varieties, and if distinguishable, those least subject to attack, should be sown early and thickly; quick-acting fertilisers should be liberally applied; and rows of early squashes, to be sown at intervals of two weeks so as to supply constant young plants, should be planted at intervals to lure the insects from the cucumbers and melons and to serve as traps, on which and on other plants, especially in July and August, infested blooms, as well as all insects, should be destroyed. Frequent and thorough spraying with a mixture of 1 lb. lead arsenate paste to 10 galls. water is recommended; and for borers the covering of the vines with soil one or two feet from the base, to produce secondary roots, and the slitting lengthwise of the vines where the borer is at work, thus killing it and not the plant.

PASTRE (Jules). **Le Sporotrichum et les Chenilles bourrues.** [*Sporotrichum* and *Arctia caja*.]—*Bull. Agric. de l'Algérie et de la Tunisie, Algiers*, 1st July 1913, pp. 283-284.

In the vineyards of Hérault, the larvae of *Arctia caja* are often found dead or in a swollen and flabby condition. These latter soon die, and remain distended after death, being filled with a whitish substance, which grows and makes its appearance on the skin and hairs. This has been recognised by M. Henri Sicard as the fungus *Sporotrichum globuliferum*, which the moisture has enabled to attack the insect this year, thus supplementing the work of *Apanteles caja*, *Degeeria funebris* and *Erynnia nitidula*. Experiments are being made with the object of propagating the fungus artificially, but with slender results so far; indeed, it appears only to have affected the first generation of larvae.

RUBY (J.). **La lutte contre la mouche de l'olive.** [The struggle against the Olive fly.]—*Bull. Agric. de l'Algérie et de la Tunisie, Algiers*, 15th July 1913, pp. 292-296.

Further experiments on the banks of the Berre pool have confirmed the results previously obtained, viz., that sprays of diluted sugar molasses, mixed with alkaline arsenate, are very effective against "keïroun," as the larva is called, but that poisoned baits, either in bags filled with impregnated sawdust, or in dishes, have no appreciable value. The same grove was chosen as before, as it is large, isolated and likely to be attacked by *Dacus*, as it was everywhere in 1912, owing to its proximity to the tank and the number of "Saurine" trees (specially liked by the insect) in the

most sheltered part. The spray was composed of 30 lb. of molasses, to which 2·5 per cent. of sodium arsenate had been added, and of 20 gallons of water. It was used for the first time on the 8th July, when the fruit were quite small and there were no signs of any insect. With an ordinary sprayer a man was able to treat from 700 to 900 trees per diem, only ½-⅔ pint being required for each. By the end of August the rains had washed off all the spray, and since many olives had been attacked elsewhere and the majority contained pupae, the selected olive grove was sprayed again on the 6th September to protect it against the coming brood of flies. On the 5th October the sprayed parts of the grove gave 4·3 per cent. of attacked trees, as against 41·3 per cent. in the rest; and on the 5th November, while the crop was being gathered, the percentage attacked was 8·4, as against 77·9. The necessity of keeping up the treatment has been shown in a grove at Logis-Neuf, where less than 10 per cent. of the trees sprayed in 1910 and 1911 were attacked, as compared with over 60 per cent. of the controls; whereas in 1912, when neither set of trees was sprayed, the percentages became 72 and 75 respectively. Besides the premature fall of the fruit, *Dacus* brings about a smaller yield of oil; and it was found that three double decalitres of sprayed olives gave 10 litres of oil, a quantity which it took five double decalitres of unsprayed fruit to produce; and as spraying only costs from 2s. 4d. to 3s. 4d. an acre, the result amply justifies the expenditure. The author, recapitulating the facts given above, adds that in places like Corsica and the Maritime Alps, where the crop is tardy, a third spraying in the autumn is advisable.

Feytaud (J.). **La Vanesse du Chardon et de l'Artichaut**—*Vanessa (Pyrameis) cardui*, L. [The Vanessa of the Cardoon and the Artichoke.]—*Bull. Soc. d'Etude et de Vulgar. de la Zool. Agric., Bordeaux*, August 1913, pp. 109-114, 1 fig.

The author recapitulates the evidence of Messrs. Tschaen ("Un parasite de l'Artichaut," *Progrès agricole de Montpellier*, 20th July 1913) and Vidal (Société Nationale d'Agriculture, 9th July 1913) as to the attack made this year by *Pyrameis cardui* upon the artichokes in the district of Hyères. The larvae, hundreds of which were found on each plant, destroyed whole plantations in a few days, eating all the green parts and leaving only the larger veins of the leaves and the flower-stems, and passing in a body from one field to the next as soon as they had stripped it. The author recalls a similar devastation of the artichoke crop at Hyères in 1880, and at Blanquefort and Parempuyre, north of Bordeaux, in May and June 1906. He recounts the various records as to migrating swarms of this butterfly, and gives a list of its food-plants, which are numerous. In 1906 Prof. Boyer successfully used nicotin and lead arsenate sprays, but the latter can only be applied before the flower-stalk develops. At Hyères this year insecticides proved a failure, but that was probably because they were used too late. Every pupa examined was found to have been attacked by Chalcididae.

GARCIA (J. N.). **Problemas agricolas por los trigos de Castilla.** [Wheat Pests in Castile.]—*La Ciencia Agricola*, iii, no. 45, 15th July 1913, pp. 2-4.

The author says that wheat pests have done much damage in the district of Campos and have caused considerable alarm to farmers. One of these is a Pentatomid bug, probably *Aelia acuminata*, L. ("Sanpedrito") which, according to A. G. Romero, also occurs at Tordesillas. The insect attacks the grain of wheat in the ear when it is tender, sucking the juice and greatly interfering with its growth. Any grain that may not be attacked is practically spoiled for food purposes, as it carries the characteristic offensive odour of the insect. The author says that really effective insecticides have to be used in such a strength as to damage the plant and that they are not to be recommended. If the foci of attack are relatively small, it is best to isolate them by an open ditch which may be filled with dry grass or straw on which the insects will collect in their attempts to pass and which may be burned. The Marquis of Solana, chief of the Agricultural Service of the Province of Valladolid, after visiting Tordesillas, confirms the identification of this insect as *Aelia acuminata*, L. (*rostrata*, de G.) and says that it is known in Andalucia and Palencia. The imago does not appear until the end of May, and it would seem that the eggs are laid eight or ten days afterwards, at the earliest, in the wheat stalk. The insect remains in the ear in the morning, and during the heat of the day the infested corn should be shaken into a funnel to which a bag is attached (like that used in vineyards, and capable of being strapped to the waist of a man or boy), when great numbers of the pest will fall out of the ears. This method is undoubtedly successful, but isolation and burning of the foci, first sprinkling them with gasolin, gives quicker results if applied early.

A. Ortega reports that in Castile a species of grasshopper does considerable damage to wheat during the latter half of May and the beginning of June, working in concentric circles and attacking the more developed and earlier cornfields, especially those on compact, clayey soil. The destruction done by it lasts from 10 to 12 days, according to the weather. The imagos collect in large numbers during the evening and settle in clusters in uncultivated spots, such as the borders of fields, hedges or pastures, but not in stubble, and here lay their eggs. Its development, and the harm done by it, are much the same as in the case of the locust. The remedies suggested are the breaking up or burning off, in September, of all uncultivated areas in the infested district, and the multiplication of birds in every possible way, such as limiting their destruction by man and birds of prey and increasing the number of trees.

**La situation viticole en France.** [The condition of the French vineyards.]—*Bull. Bi-mens. du Gouvernement Général de l'Algérie, Paris*, nos. 14 and 17, 15th July and 1st Sept. 1913, pp. 230-231 and 289-291.

In an epitome of the official reports (no. 14) on the vineyards in different Departments in France, it is stated that on the 1st of

July *Clysia ambiguella* was abundant, and caused serious anxiety in Allier; it had been observed in various parts of the Gard; there was a little of it in the Haute-Garonne; an invasion was feared in the Puy-de-Dôme; a serious incursion had taken place in the Tarn-et-Garonne; and it abounded, as did also *Polychrosis botrana*, *Pyralis* and *Haltica*, in Hérault, where insecticides were being freely used. Further reports (no. 17) state that it was not yet certain whether a second generation of *Clysia* and *Polychrosis* would become dangerous in the Aude. Both insects had appeared all over Aveyron and had recently increased considerably. *Clysia* had attacked the Corrèze vines, but had done little damage so far. Many growers were preparing to use nicotin in Maine-et-Loire against an expected second generation; in the Dordogne it was already being tried for the same purpose, the vines being clipped and sprayed with sulphur meanwhile. The moths, against which lamps were being used in various places, had spread over the whole region of the Marne.

**Un insecte ennemi du blé.** [An insect pest of wheat.] *Bull. Bi-mens. du Gouv. Général de l'Algérie, Paris*, no. 15, 1st Aug. 1913, p. 248.

In a summary of a paper read by M. Vermeil before the Oran Agricultural Society, the Bulletin states that *Aelia acuminata*, called "mouteberg" by the natives, has done great damage this year in the Saïda, Tiaret and Bossuet districts, while in the Tell, where it finds other food, it is not so destructive to wheat. On the high table-lands it hibernates under tufts of Alpha grass (*Macrochloa tenacissima*), and does not attack cereals—of which it is only an accidental, though sometimes a dangerous, parasite—until the *Macrochloa* becomes too dry to afford it sufficient food. It then fastens upon the grains of wheat in the milky stage, pierces them with its rostrum and pumps out the contents. Where the rows are far enough apart, a man can collect the insects by passing a net over the ears, and can thus treat from six to seven hectares (15-17 acres) a day; but no scientific means for their destruction has as yet been devised.

Jack (Rupert W.). **Borers in Native Timber. Results of Experiments with Preservatives.**—*Bull. no.* 154, *Dept. Agriculture, Salisbury, Rhodesia*, August 1913, pp. 2-7, 2 plates.

In order to furnish information as to the treatment of the wood-boring beetles attacking msassa (*Brachystegia randii*), mtondo, mfuti, mahobohobo, etc., especially in the warm, damp galleries of the mines, the author treated a number of tree lengths in various ways in August 1910. Soaking for 24 hours in sodium arsenite, whether its strength was 2½ lb., 5 lb., or 10 lb. to 10 galls. of water, secured immunity; Cooper's Sheep Dip—1 packet to 25 gallons, tried both for 24 and 68 hours—reduced the holes to a minimum, as did also 24 hours in Jeyes' Fluid (1 to

poor, and 24 hours in a mixture of 64 oz. crude carbolic acid, 1 oz. caustic soda and 4 galls. water. A like effect was produced by a double coating of coal tar, both when applied cold and at 180° F. Practically no protection was given by any of the following dressings: Jeyes' Fluid, 1 to 10; the mixture of crude carbolic, caustic soda and water, when the carbolic was reduced to 64 oz.; double coats of Stockholm tar (whether cold or at 180° F.), of pure Jeyes' Fluid, crude carbolic, or carbolineum, all at 180° F., or of solignum, at either temperature; white or red lead, or a mixture of 4 oz. of the latter with 1 oz. of white arsenic, even when two coats were applied; or by 4, or even 8, weeks' soaking in water or in brine. The use of sapolin varnish resulted in very few holes, even when put on only once; but the author thinks this may be ignored, as elsewhere a thorough dressing of carbolineum, coupled with varnishing, proved ineffectual.

The author concludes that for outdoor purposes a solution of arsenite of soda, supplemented by a coating of hot coal tar when there is exposure to the weather, is advisable, especially as both are very cheap locally; but indoors, as it is problematical whether a coating of varnish would prevent arsenical fumes, coal tar should be resorted to. Thorough drying, to ensure maximum penetration, is insisted upon, and a doubt is expressed whether this was sufficient in some of the experiments which did not turn out better, such as that of Cooper's Dip; though the only partial success of this may have been due to too small an admixture. The effect of a larger proportion of soluble arsenic has been shown by a 400 gallon five-day dip of 8 lb. sodium arsenite, 5½ lb. soft soap and 2 galls. paraffin, which instantly stopped the work of borers in tobacco sticks thrown into a cattle-dipping tank—a very useful appliance for soaking—and, after a week in the dip, kept them from being attacked again.

VIELLET (A.). **Ravages du Bostriche bidenté dans la Marne.** [Damage to Austrian pine in the Marne by *Pityogenes bidentatus*, Herbst.]—*La Revue de Phytopathologie Appliquée, Paris*, i, no. 8, 20th Sept. 1913, pp. 111-112.

Certain plantations of *Pinus austriaca* in the department of the Marne have suffered seriously in the present year from attacks by a minute beetle, *Pityogenes bidentatus*, Herbst. The author says that this insect is not merely one of the most serious enemies of the black pine but of all other species of pine cultivated in France. It appears to confine its attack to trees between 5 and 10 years old, boring galleries in the smaller branches immediately beneath the bark. It can be more or less successfully met by the judicious use of "trap branches," that is to say, by leaving in the forest after the spring cutting, certain cut branches on which the insects will oviposit. These branches are collected and burnt in May. The species has at least two generations in the year, and as the development is irregular and more or less continuous it is well to renew these trap branches every month. Another species *P. quadridens* also damages pines in the same way and can be met by the same methods.

VUILLET (A.). **Les vers des Écussons de Rosiers.** [A Maggot attacking grafted rose buds.]—*La Revue de Phytopathologie Appliquée*, i. no. 8, 20th September 1913, p. 112.

The writer says that in the month of August he received from the neighbourhood of Angers specimens of *Rosa canina* which had been budded 3 weeks previously and the "buds" of which were eaten by minute red maggots. He is of opinion that they were the larvae of *Clinodiplosis oculiperda*, Rübs. This Cecidomyid does not appear to have been noted before in France as an enemy of rose trees, but it is known to have frequently caused considerable damage in Germany. The perfect insect is to be met with from the middle of June to the middle of August. The female lays 6 to 12 eggs on each "bud." It also attacks other plants, *e.g.*, fruit trees. The author says that it is well, in place of the usual raphia grass used to fasten the grafted buds, to employ woollen or cotton thread previously soaked in turpentine to which a small quantity of naphthalin and linseed oil has been added. These threads should be very carefully dried before being used. Grafts made near the surface of the soil can be efficiently protected by earthing up.

VUILLET (A.). **Deux ennemis du Cocotier de la région Malgache.** [Two enemies of the coconut-palm in the Madagascar region.]—*L'Agronomie Coloniale, Paris*, no. 2, 31st Aug. 1913, pp. 33-37, 1 pl.

The Lymexylonid beetle, *Melittomma insulare*, Fairm., appears to be abundant in the Seychelles, where it has been observed by M. Rivalz Dupont (Cf. "Contribution à l'étude du cocotier aux Seychelles," Mahé, 1912), towards the end of the year. The female lays on the trunks of coconut palms, near the ground, wherever the bark has been injured. The young larva, called "petit moumouc" in Seychelles, makes its way into the tree by means of a horizontal gallery, which becomes vertical when it reaches the soft parts within. The larvae may be very numerous and bring about decomposition of the tissues, rapidly followed by the death of the tree. If the foot of the tree be examined, the larvae will be found within the bark, amidst a reddish powder. The insect has also done considerable damage in the island of Berafia, north-west of Madagascar. The trees should be watched, the diseased parts cut out and burned on the spot and the wounds covered with a layer of coal tar. If the damage has gone too far the tree should be cut down, to prevent it from becoming a centre of infection. Prevention is limited to the avoidance of orifices in the bark. Many of these are due to superfluous roots above ground, which, on decomposition, leave openings into which parasites make their way. These roots can be prevented by careful cultivation and weeding, by filling up the cavities hollowed out near the trees by tropical downpours, etc. Coal tar, moreover, while it will keep away the females and prevent them from laying in the tree, will help to heal any wounds there may be in the bark.

A large weevil, *Rhina nigra*, Drury, was found by M. Quesne invariably to attack the coconut palms in Berafia at about 5 feet above ground, not taking advantage of the damage done at the foot of the trunk by *Melitomma*. The female lays in a little cavity in the bark, which she makes with her rostrum, and the larvae penetrate into the harder parts of the wood, in which they hollow out numerous galleries. Prevention is the best weapon against this insect. Everything must be done to avoid damage to the bark, and unavoidable wounds should be given a layer of coal tar. If the eggs are laid in a definite part this can be protected by insecticides, such as thick milk of lime to which 1 lb. of lead arsenate per 10 gallons has been added. At Berafia the eggs were scraped away and coal tar applied. Trap trees, so cut as to ensure the fermentation of the wood, are useful, as these are chosen for oviposition and it is afterwards easy to destroy the larvae by boiling water or other means.

URICH (F. W.). **Entomologist's Report. Trinidad.** —*Minutes of Meetings of Board of Agric.*, no. 7, 15th Aug. 1913, p. 41.

The author says that cacao beetles (*Steirastoma depressum*), which are found all over Trinidad, do more damage in the south than the north, where there are sporadic attacks in shadeless spots swept by the wind. He suggests trapping the adult insects, cutting out larvae, shading by figs or immortelles and spraying or painting the branches with lead arsenate. Another Longicorn beetle, *Oncideres tesselatum*, has been found to cut off the branches of pois doux, as well as of Saman trees. As eggs are laid in the parts cut off, these should be burnt.

WELDON (G. P.). **The Fruit-tree Leaf-roller.** —*Mthly. Bull. State Comm. Hort., Sacramento*, ii, no. 9, Sept. 1913, pp. 637-647, 5 figs.

There have been cycles of good and bad years in Colorado, New Mexico, New York and other Eastern States with regard to *Archips argyrospila*, Walk. (the Fruit-tree Leaf-roller). It may, after being unperceived for years, suddenly develop into an important pest, and in the sequel be practically eradicated by parasites. The eggs are laid in mosses, on bark and on posts, barns, walls, etc., in late June and early July; the larvae hatch in time to feed on the bursting buds, leaves and fruit in the spring; pupation takes place, within a month, inside the rolled leaf, and the imago appears in about ten days. The insect feeds on the apple, plum, cherry, pear, currant, gooseberry, raspberry, rose, poplar, elm, locust tree, alfalfa, onion and other plants. It destroys the tender blossoms, eats the fruit and foliage, and, as it often leaves no fruit buds, causes the loss of the succeeding season's crop. Lime and sulphur are useless against this pest.

The eggs should be destroyed in winter by soluble oil sprays penetrating the coating of the moss, 1 gal. of Scalecide, Carboleine or Target Brand to 19 gals. water being used, and 6 to 10

gals. per tree applied. Thoroughly drenching with 3 lb. lead arsenate to 50 gals. water or 1 part "Black Leaf 40" to 800 parts water, will kill the young larvae just after the leaves come out in the spring. Apple trees should be drenched again just before blooming and after the buds have separated, and a third time when 90 per cent. of the petals have fallen and before the calyx cups close. This third drenching is also effective against the codling moth. Later sprays are useless.

MASKEW (F.). **A Constant Menace.**—*Mthly Bull. State Comm. Hort., Sacramento*, ii, no. 9, Sept. 1913, pp. 653-654.

The discovery of a number of specimens of *Sphenophorus (Rhabdocnemis) obscurus*, Boisd. (the Hawaiian Sugar-cane Borer), at San Francisco, in a crate of pineapples sent from Honolulu, gives the author an opportunity of pointing out that the Mediterranean fruit fly might just as easily have been in the crate as these weevils, which do not attack pineapples, and doubtless merely entered it as a hiding-place. Pupae of the fruit fly have been found in all sorts of unlikely places, such as the seams inside gunny bags that had contained bell peppers, and the author suggests that no products from Hawaii should be admitted into California unless accompanied by an official record that from the time of cutting, through all processes of packing, hauling and storing, they have not been in the immediate vicinity of any material infested by the fly.

VOSLER (E. J.). **The Red-humped Caterpillar.**—*Mthly. Bull. State Comm. Hort., Sacramento*, ii, no. 9, Sept. 1913, pp. 654-657, 4 figs.

*Schizura concinna*, S. & A. (the Red-humped Caterpillar), is found throughout the United States, and is common in Central California. Its food-plants are the apple, hawthorn, prune, plum, cherry and walnut. The imago lays on the leaves in May, June and July; the larvae are most abundant in June and July, after which, up to September, they pupate in the ground or under rubbish, and the adult emerges in late spring and early summer. Hand-picking, and a spray of 5 lb. lead arsenate to 100 gals. water, are recommended. *Apanteles* sp. and *Limnerium* sp. parasitise the larvae, and it is hoped that *Calosoma sycophanta*, recently imported, will assist in reducing them.

ESSIG (E. O.). **The Fruit-tree Bark-beetle.**—*Mthly. Bull. State Comm. Hort., Sacramento*, ii, no. 9, Sept. 1913, p. 658.

The first appearance of *Scolytus rugulosus*, Ratz. (the Fruit-tree Bark-beetle), in California has been reported from Ontario. It was found there upon apricot trees, but it also attacks the plum, pear, peach, apple and cherry. It breeds in weak trees and

spreads to healthy young ones, boring into the tips of young branches in the spring. Badly infested trees or branches, with all dead wood, should be burnt; young trees should be protected, in October or November, by whitewash, Bordeaux paste, or a thick soap wash containing 1 pint crude carbolic acid to every 10 gals.; and the trunk and limbs should be sprayed with a mixture of 3 lb. naphtha soap, which, after being dissolved in 3 gals. boiling water, has had 1 gal. carbolineum well shaken up with it and has then been diluted with 4 gals. water. Those using the spray should be protected against the carbolineum.

Essig (E. O.). **The Codling Moth attacking Walnuts.**—*Mthly. Bull. State Comm. Hort., Sacramento*, ii, no. 9, Sept. 1913, p. 659.

Soft-shelled Santa Barbara walnuts have been attacked by codling moths along the foothills near Carpinteria, in California. Already, in 1909, this insect had been found in Contra Costa County to attack, besides apples, pears, peaches, plums and chestnuts, the Mayeth, Franquetta, Parisienne and Concord varieties of walnuts, burrowing through the green hull at the stem end, and feeding on the kernel. The later broods attack the walnuts, in which they appear in August and September; they hibernate inside them or on the shells, and the adults emerge in April and May. Spraying against the earlier broods on apples, pears, etc., destroying culls and windfalls of pears, which are breeding places for the walnut brood, and spraying the walnuts in August, are the remedies suggested.

Compere (G.). **A new beginning in the Importation and Establishment of Beneficial Insects.**—*Mthly. Bull. State Comm. Hort., Sacramento*, ii, no. 9, Sept. 1913, pp. 660-661.

The author observes that since the red, purple, and black scales and citrus mealy bugs are held in complete subjection by natural checks in the Eastern States, the steps being taken to import these checks into California may be expected to prove as beneficial as was the introduction of *Vedalia*, the exterminator of *Icerya purchasi*, from Australia.

Vosler (E. J.). **A new Parasite of the Black Scale.**—*Mthly. Bull. State Comm. Hort., Sacramento*, ii, no. 9, Sept. 1913, pp. 661-662.

The presence in California of a number of adults of *Zalophothrix* sp., a consignment of which was received from the West Indies, leads the author to hope that this parasite will prove effective against the immature forms of *Saissetia oleae*, Bern. (the Black Scale). In this *Scutellista cyanea* fails, for its larva leaves enough eggs of the scale to enable it to reinfest an orchard, and does not act until the young scales have had time to suck the sap.

ESSIG (E. O.). **The Potato Tuber Moth.**—*Mthly. Bull. State Comm. Hort., Sacramento*, ii, no. 9, Sept. 1913, pp. 666-669, 1 fig.

The potato-tuber moth has been threatening California, as well as the States of Oregon and Washington, and the author suggests that no infested potatoes should be sent to any point within or without the State, that seed potatoes should only be obtained from districts known to be entirely free, and that they should be thoroughly inspected before planting.

MASKEW (F.). **County Horticultural Commissioners and State Quarantine Guardians.**—*Mthly. Bull. State Comm. Hort., Sacramento*, ii, no. 9, Sept. 1913, p. 670.

The agreement of the County Horticultural Commissioners to co-operate with the State Office, says the author, will create an impregnable wall of protection in the State, through which no infested shipments can pass. To this end prompt information as to imported horticultural products at interior points should be sent to the Central Office, which will afford information as to insect pests and their hosts in the world at large, and the laws enacted for the protection of the country.

LONYAY (F. de). **Viticulture in Hungary.**—*Mthly. Bull. of Agric. Intelligence and Plant Diseases, Rome*, no. 8, Aug. 1913, pp. 1142-1149.

The first appearance of *Phylloxera* in Hungary took place in 1875, at Pancsova and elsewhere in the south, and, though the affected vines were at once uprooted, the pest spread throughout the country after 1880. Up to 1884 the area planted increased faster than that laid bare, but from the following year the pest began to destroy more than could be replaced, and by 1894 the 1,050,978 acres of 1875 had dwindled to 606,150 acres. A subsequent recovery raised the total, in 1911, to 883,924 acres, of which, in Hungary proper, 259,350 acres contained vines grafted on American stocks, 99,889 acres had been treated with carbon disulphide, 94,317 acres had compact soil and 317,222 acres were sandy. The chief remedies in use are grafting on American stocks, the yearly use of carbon disulphide and planting in sandy soil. There is much of this soil in Hungary, and *Phylloxera* has made its value known. The introduction of American direct bearers found little favour, and it proved impossible, owing to the hilly character of most old vineyards, to resort to flooding. The Government has given much assistance in various ways, providing carbon disulphide and giving instructions for its use, promoting the establishment of nurseries, and facilitating loans on advantageous terms.

Dalmasso (G.). **Un microlepidottero ampelofago poco noto.** [A little known vine-eating Microlepidopteron.]—*Riv. di Vitic. Enologia ed Agraria, Conegliano*, xix, no. 19, 1st Oct. 1913, pp. 443-445.

Commenting upon a monograph by Picard in the "Progrès Agricole," the author says that the larvae of *Cacoecia costana*, F., feed on a number of plants peculiar to marshy ground, but also, when the soil is damp, as after flooding against *Phylloxera*, on the vine, which they damage much in the same way as *Sparganothis*. They appear at the beginning of spring, when the plants first germinate, gnaw the tender parts and envelop the leaves and young shoots in silken threads. They pupate about the beginning of May and the moths appear in the latter half of the month. A second generation, which greedily devours the leaves and sometimes cuts the peduncles of the fruit, appears in June in the South and in July-August in the North. Another brood emerges about the end of summer, and the larvae from these hibernate till the spring. Tachininae and Ichneumonidae parasitise the larvae, which are protected against sprays by their silken covering. The best remedy is the removal of infected shoots at the beginning of germination. Scalding, so commonly used against *Sparganothis*, is ineffective against *Cacoecia*, as it quickly spreads to the vines from other plants near them.

Webster (F. M.). **The Western Corn Rootworm.** *Bull. no. 8, U.S. Dept. Agric., Washington, D.C.*, 27th Sept. 1913, pp. 1-8, 5 figs.

The author states that *Diabrotica longicornis*, Say (the Western Corn Rootworm) differs in several respects from *D. duodecimpunctata*, Oliv. The eggs are laid in late August and in September, the larvae hatch out in May and June, pupate in the soil and emerge as adults in late July and August. The insect was observed in Arkansas Territory in 1823, and in 1866 it was again noticed in Kansas, living on sorghum and on a large species of thistle. It had previously been found on flowers in Central Illinois. In 1874 and 1878 it was seen at Kirkwood and Eureka, Mo., respectively, burrowing in maize roots in the former instance. In Illinois it was rare in 1874, but in seven or eight years it had grown so abundant that maize could no longer be grown without a rotation to wheat, oats, barley, rye or some other crop of small grain, a change eliminating the pest, except in a very few instances, as yet unexplained. Since 1882 much damage has been done by the insect at La Fayette, Sumnan, and other places in Indiana. Thus, from 1874 to 1902, it took possession successively of Illinois, Indiana and Ohio, in 1911 and 1912 it was at Duck River, in Central Tennessee, and in 1913 it had reached Chattanooga. It appears to be going down the rivers flowing through the Southern Atlantic and Gulf States; and so that, though it extends from Nova Scotia to southern Minnesota and South Dakota, and to Alabama and southern New Mexico, the greatest damage done by it has been in Illinois, Indiana, Ohio,

Iowa, South Dakota, Nebraska, Missouri, Tennessee and probably Kentucky. Since the species has long existed in, and even now extends to, regions where it does no damage, the author is of opinion that the harm is done by a special race feeding on maize silk and pollen; and he believes this race to have originated in the prairie country in Illinois. Up to 1862 the chief crop there was spring wheat, but maize was then substituted as food for pigs, for which the Civil War created a great demand, and rotation of crops was abandoned. The beetles may gradually have been attracted from other plants by the resulting pollen and silk, which is their chief food in the maize fields, where they swarm in the ears during summer and early autumn, while the larvae work in the roots during June and July. The imago sometimes feeds on the leaves, but it only eats the unripe kernels when they have been pecked by birds, and it also only attacks ripe apples when the skin has been broken. It feeds, outside maize fields, on thistle, sunflower, goldenrod, cucurbit, cotton, clover, rose, evening primrose, aster and smartweed pollen, on the spores of fungi, and on the leaves of cucumber and beans. The flooding of the land in which the eggs have been laid does not appear to affect them, and their diminution by *Chordeiles virginianus*, *Myiochanes virens*, *Sporotrichum globuliferum*, or by *Celatoria diabroticae*, and the larvae of *Drasterius elegans* (the Click-beetle) is not very extensive.

WEBSTER (F. M.). **The Southern Corn Rootworm, or Budworm.** *Bull. no. 5, U.S. Dept. Agric., Washington, D.C.*, 27th Sept. 1913, pp. 1-11, 2 figs.

*Diabrotica duodecimpunctata*, Oliv. (the Southern Corn Rootworm) is found east of the Rocky Mountains from Southern Canada to North Carolina, Tenessee, Arkansas and Oklahoma. Like *D. vittata*, F., it collects in the blossoms of "squashes" and pumpkins, and late in summer and during the autumn it also frequents the various species of *Solidago* (Golden Rod). The imago eats almost any cultivated plant, including maize, wheat, oats, rye, barley, alfalfa, cowpea, soy bean, clover, etc.

Larvae and pupae have been observed at the roots of maize, wheat, oats, rye, garden beans, *Panicum miliaceum* (millet), *Bromus unioloides* (southern chess) *Rudbeckia* sp. (golden-glow), sedges of the genera *Cyperus* and *Scirpus*, *Datura stramonium*, *Sorghum halepense* (Johnson grass, Aleppo millet grass), *Amaranthus* (pigwood), *Echinochloa crus-galli* (cockstoot grass) and alfalfa.

The insect hibernates as an adult northward of Brownsville, Tex., where oviposition takes place in the latter half of January. There appear to be two generations wherever hibernation takes place, but further south, where it does not, there may be only one. The egg period in different places varies from 7 to 24 days, the larval from 15 to 35 and the pupal from 7 to 13. The eggs are pushed down into the soil, which is generally that of the low and damp parts called "black lands," and the larvae make their way beneath the soil from one plant to another, grooving the roots and underground stems, and sometimes perforating the base

of the plant and destroying the central leaves. The insect thus keeps out of reach of attack, and rotation of crops appears to be no remedy for it, so that the only effective check—for *Celatoria diabroticae*, Shim., is too rare to parasitise the adult to any extent and it is only a conjecture that *Dasterius elegans*, F., feeds on the budworm—is to time planting so as to bring the young maize above ground after most of the eggs have been deposited, but not late enough to be attacked by the second generation, which is abroad in late June and early July in Northern Georgia, and in July in Northern Indiana. In the South, where the pest extends to the Gulf and into Mexico, the crop is always damaged early in the season, viz., in March or April, and to the northward up to May.

The author states that the insect has been found in the stomachs of the bobwhite, *Colinus virginianus*; scaled quail, *Callipepla squamata*; California quail, *Lophortyx californicus*; Prairie chicken, *Tympanuchus americanus*; wild turkey, *Meleagris gallopavo*; yellow-bellied sapsucker, *Sphyrapicus varius*; red-headed woodpecker, *Melanerpes erythrocephalus*; nighthawk, *Chordeiles virginianus*; scissor-tailed flycatcher, *Muscivora forficata*; kingbird, *Tyrannus tyrannus*; phoebe, *Sayornis phoebe*; wood pewee, *Myiochanes virens*; western flycatcher, *Empidonax difficilis*; Acadian flycatcher, *Empidonax virescens*; Trail's flycatcher, *Empidonax trailli*; least flycatcher, *Empidonax minimus*; red-winged blackbird, *Agelaius phoeniceus*; meadow lark, *Sturnella magna*; Bullock's oriole, *Icterus bullocki*; cardinal, *Cardinalis cardinalis*; rose-breasted grosbeak, *Zamelodia ludoviciana*; cliff-swallow, *Petrochelidon lunifrons*; white-eyed vireo, *Vireo griseus*; and American robin, *Planesticus migratorius*.

RADETZKY (A. F.). ЯЙЦЕѢДЪ ПЛОДОЖОРКИ ОПИСАНІЕ, БІОЛОГІЯ И УТИЛИЗАЦІЯ ЕГО ВЪ ДѢЛѢ БОРЬБЫ СЪ ЯБЛОННОЙ ПЛОДОЖОРКОЙ [*Oophthora semblidis*, Aur. (*Pentarthron carpocapsae*, Ashm.); description, biology, and utilisation of it in the struggle with *Carpocapsa pomonella*, L.] Turkestan Entom. Sta., Tashkent, 1913, 28 pp., 1 pl.

The chief ally of man in the struggle against *Cydia* (*Carpocapsa*) *pomonella*, L.,* in many fruit districts of Russia appears to be a small hymenopterous parasite of the family of CHALCIDIDAE, *Trichogramma semblidis*, Auriv.† which destroys the eggs of *C. pomonella*, L., in enormous quantities.

This insect was discovered in Sweden by Aurivillius in 1897, as a parasite of the eggs of *Semblis lutaria*. It was found in Russia in 1903 by J. F. Schreiner in the Government of Astrachan, and by I. V. Vassiliev in the Kharkov Government in 1904.

* Mr. J. Hartley Durrant informs us that neither *Carpocapsa* nor *Laspeyresia* can stand as generic names for the codling moth, which should be referred to *Cydia*.—ED.

† Under this name the author includes *T.* (*Pentarthron*) *carpocapsae*, Ashm.; but Mr. A. A. Girault, who has examined the types of this insect, has recently stated that it is distinct from *T.* (*Oophthora*) *semblidis*, Auriv.—ED.

In 1903 and 1904, in the gardens of the town of Astrachan, according to the observations of Schreiner, no less than 65.10 per cent. of the eggs of *C. pomonella* were infected by this parasite. This enormous percentage was confirmed by Vassiliev in 1906 and in 1910.

In the year 1911 the author imported the *Trichogramma* from Astrachan to the fruit district of Tashkent, where up to that time it was not known, and caused them to multiply in the laboratory in enormous quantities and then let them loose in the orchards. The insects readily became acclimatised and in 1912 in certain gardens in Tashkent destroyed up to 100 per cent. of the eggs of *C. pomonella*.

The parasite presents the valuable characteristic that it is able to develop at the expense of many different species of Lepidoptera and other insects. Among the injurious insects, it was obtained in European Russia from the eggs of *Dendrolimus pini*, L., *Malacosoma neustria*, L., *Euproctis chrysorrhoea*, L., *Lymantria monacha*, L., and *Stilpnotia salicis*, L. (I. V. Vassiliev). In Turkestan the author obtained it from the eggs of *Sarrothripus musculana*, Ersch, and *Cydia funebrana*, Tr. In Italy large quantities were obtained from the eggs of *Barathra* (*Mamestra*) *brassicae*, L. (Masi).

Thanks to these qualities, *T. semblidis*, after the extermination of the codling moth, will not be doomed to destruction, but will continue its existence at the expense of other insects.

The number of eggs laid by the female in the middle of summer amounts to over one hundred. In one egg of the codling moth it deposits from one to six eggs.

The complete development of the Chalcid from egg to imago lasts on an average 9 days, but depends on the temperature. The development of the eggs takes from one to one and a half days, that of the larvae 5 days, and that of the chrysalis 3 days. In Tashkent in July the total development lasted not more than 7 days, but in the end of August up to 12 days.

The full-grown insect lives 11 days, but the laying of the eggs takes place only during the first days after hatching. From the middle of June to the middle of September the author succeeded in producing eight generations in Tashkent.

With regard to the hibernation of the parasite the author's observations led him to believe that any wintering egg can serve as a host for this purpose, and even eggs which under normal conditions would not winter. At the time of writing (beginning of October 1912), the parasite was wintering as a larva in the eggs of *Catocala elocata*, Esp., *Grammodes algira*, L., *Apopestes spectrum*, Esp., a Lasiocampid moth and some others. According to Vassiliev the larvae of the parasite hibernate also in the eggs of *Orgyia*. Under natural conditions the parasites cannot always find sufficient hosts in which to winter, so that only a small number of them survive. Notwithstanding its polyphagous instincts the parasite attacks chiefly the eggs of *C. pomonella* and in the presence of these eggs never touches any others.

COLLINGE (W. E.). **Seventh Annual Report of the Honorary Consulting Biologist.**—*Journ. Land Agents' Soc.*, Oct. 1913, pp. 1-24. (Reprint.)

In the course of a sketch of various pests, the author states that *Phratora vitellinae*, Kirby (the Willow Beetle), injurious to the growing points of young osiers, deposits its eggs in clusters on the underside of willow, poplar and sallow leaves, upon which the larvae feed as soon as they hatch out. When fed they fall to the ground and pupate, and the imago appears in autumn. They hibernate under bark, and in rotten wood and rubbish, which should be burnt in winter. Shaking the insects off the twigs into vessels containing paraffin, or on to insecticides poured on the ground, is more effective than spraying with Paris green, quassia, etc.

*Aphis amygdali*, Fons., attacked peaches and apricots in May, and *Rhopalosiphum dianthi*, Schrk., later in the summer. Both insects are called the "Peach Aphis." The former leaves the peach in summer and returns in autumn. Frequent spraying with quassia and soft soap is recommended, but fluids containing paraffin injure the leaves and fruit. For *Schizoneura lanigera*, Hausm. (the Woolly Aphis) the roots should be uncovered in winter and treated with almost boiling water, or two to three pounds of a mixture of equal parts of naphthalin and sand should be scattered over them and covered with soil. For the branches, 7 lb. linseed oil, 2½ lb. white lead and 1 lb. zinc oxide should be boiled together for 10 minutes, and mixed, when cold, with 1 lb. turpentine. This new remedy should be applied with a brush, in the autumn and at the end of June. The larvae of *Pulvinaria* var. *ribesiae*, Sign. (the White Woolly Currant Scale) hatch out in June or July and run all over red and black currant plants. Three moults, followed by hibernation, take place on the previous year's wood, and growth recommences in March or April. The bushes should be sprayed with paraffin emulsion when the larvae hatch, and in January or early February with a mixture of 2 lb. 98 per cent. caustic soda, ¾ lb. soft soap, 5 pts. paraffin and 1 gal. water.

*Cheimatobia brumata*, L. (the Winter Moth) has done little harm for several years. The eggs of *Porthesia auriflua*, F. (the Gold Tail Moth) are laid in August on apple, pear, plum, cherry, hawthorn, hazel and other trees. The larvae appear in seven to twelve days, spin cocoons and hibernate in crevices in the bark, under leaves, etc., come out when the buds begin to swell, and pupate about the end of June. The larvae may be caught in bands of hay ropes, old sacks, etc., and lead arsenate is a good spray.

The larvae of *Phyllobius oblongus*, L. (the Oblong Leaf Weevil) and *P. maculicornis*, Germ. (the Green Leaf Weevil) feed on roots during winter, pupate in April, and in May the imago attacks apple buds and blossoms. The trees should be jarred on dull days and the falling beetles collected, and the

ground should be watered with lead arsenate or other liquid soil insecticides.

*Syphonophora pisi*, Kalt. (the Pea Aphis) oviposits in the autumn on clover and vetches, and in spring the larvae migrate to the pea plants. The insects are viviparous and produce from twelve to sixteen generations. The peas should be sown away from clover, and in rows. A shallow pan, five or six inches deep, and containing water and a film of kerosene, should be drawn between them and the aphides brushed into it, and spraying, with considerable force, of a mixture of 1 lb. whale-oil soap to 6 gal. water will dislodge the young from the terminals. Kerosene emulsion is to be avoided. When the air temperature is 95° the heat of the soil is high enough to roast the aphides if knocked off the plant and the soil raked over them. For *Aphis brassicae*, L. (the Cabbage Aphis), shepherd's purse (*Capsella bursa-pastoris*), wild mustard (*Sinapis arvensis*) and other cruciferous weeds, from which it migrates, should be destroyed and a mixture of ½ lb. soap to 1 gal. water should be applied 3 or 4 times a week. Watering with weak solutions of liquid soil insecticide will dispose of *Pemphigus lactucarius*, Pass. (the Lettuce Root Aphis), which attacks wallflower, stock and other roots as well as those of lettuce.

The destruction of injured potato stems, and of burdock, mullein, thistles, foxglove and other plants on which the larvae feed is the only remedy for *Gortyna ochracea*, Hübn. (the Frosted Orange Moth). The moths appear and oviposit in September, the larvae hatch out in April and feed till late July or early August, pupating inside the stem. Digging up the grass "headlands" round cornfields is suggested in the case of *Apamea didyma*, Esp. (the Common Rustic Moth). Pupation takes place from the middle of April to the end of May, the imago appears about the end of June, the eggs are laid in autumn, and the larvae, hatched before winter, pass from grasses to young cereals; but the particulars are still doubtful.

Ground unslaked lime or naphthalin will destroy the larvae of *Bibio marci*, L. (St. Mark's Fly) and *B. johannis*, L., introduced into nursery soil with manure or leaf-mould. The former damages tomatos, young coniferous plants, seedling ash and young spruce; the latter larch seedlings and hop roots. *Hylemyia coarctata*, Fall. (the Wheat Bulb Fly) oviposits in June and July on couch and other wild grasses, which should be destroyed. The larvae pupate in September and the imago appears in October. Other larvae attack spring-sown wheat plants in April, and against these a dressing to hasten the growth of the plant is suggested, or, if too heavily attacked, rooting up and burning. From April to May *Oscinis frit*, L. (the Frit Fly) lays on the leaves of young plants. The imago appears again about the middle of July, laying on various grasses, and if sufficiently developed, in the ears of oats and barley; and a third brood comes forth in August and September, ovipositing on different wild grasses. The destruction of these, deep ploughing, or ploughing with a skim-coulter, early sowing, as far as possible from previously affected areas, and the dressing of barley and oats with fertilisers are recommended.

CAMERON (A. E.). **On the life-history of *Lonchaea chorea*, Fabricius.**—*Trans. Entomol. Soc. Lond.*, 26th Sept. 1913, pp. 314-322, 1 pl., 1 fig.

Adults of this species were reared from larvae observed to be feeding on cow-dung. Transferred to wire-gauze breeding-cages pupation occurred in about 12 days, the adults appearing about 10 days later. The whole development from the egg to the imago occupied about 30 days at the outside. The egg of *L. chorea* is very similar in size and appearance to that of many of the ANTHOMYIIDAE, being easily recognisable amongst the cow-dung by reason of their pure white colour. The full-grown larva is 9mm. long, and is of the cylindrical form usual in Muscid larvae; the colour is dull white, and the cuticle smooth.

The larva is very tenacious of life. Plunged three times consecutively into a watch-glass containing absolute alcohol, which was each time allowed to evaporate, the larva faced the ordeal and came out alive. Keeping it in water for four hours, after this hardening process, likewise had no ill effect. An all-night sojourn in diluted beer also failed to damage it. After a short rest, it was submerged for a whole day in undiluted beer and then restored to a diet of decaying beetroot, when it shortly afterwards pupated and completed its metamorphosis.

As to its economic status, the larva is not known to cause much damage, although it may be extensively found at times attacking crops of diseased beetroot. The fly does not frequent human habitations; so that it could not be classed with the disease-carrying house-fly, which it resembles to a certain extent in its breeding habits. Rather should it be classed in that large group in which are included all "followers of decay," in that plants, such as beetroot and certain Monocotyledons, which have been previously attacked by fungus or other destructive agencies, are liable to have the injury accentuated by the larvae of this fly. The larvae may be transmitted by the use of infested dung for the manuring of soils in which the crops liable to attack are cultivated.

As to treatment, if the dung be mixed with a small quantity of some chemical fertiliser, such as commercial sulphate of ammonia, the larvae will be killed, and at the same time the percentage of available nitrogen will be increased by the admixture of the chemical. Other dressings may be used with equal effect, such as the potash salts, superphosphate of lime, etc.; but care has to be taken to use them in fertilising quantities, otherwise serious damage might be done to the plants.

GIRAULT (A. A.). Notes on the Chalcidoid Hymenoptera of the Family TRICHOGRAMMATIDAE, with description of a New Sub-genus from Australia.—РУССКОЕ ЭНТОМОЛОГИЧЕСКОЕ ОБОЗРѢНІЕ (Revue Russe d'Entomologie), S. Petersburg, xiii, no. 2, 1913, pp. 292-294.

The author records the receipt of many specimens of both sexes of *Trichogramma minutum*, Riley, from Van Dine, in Porto Rico, reared from eggs of *Diatraea saccharalis*, F.; this is a new locality. Also of four specimens reared from eggs of *Cydia*

*(Carpocapsa) pomonella* from the Iowa Agricultural Experiment Station. The types of *Trichogramma (Pentarthron) carpocapsae*, Ash., were sent by N. Kurdjumov from Poltava to the author, who pronounces them to be distinct from *T. (Oophthora) semblidis*, Auriv. The coloration of *Trichogramma* is very variable, but not to the extent of forming a different pattern, as in this species. A number of females of *Trichogramma fasciatum* (Perkins) were sent to the author by N. Kurdjumov as egg-parasites of the codling moth in Tashkent. This species is also known to be parasitic on *Diatraea saccharalis*, and is found in Russia, Mexico, and Turkestan, being probably synonymous with *T. (Encyrtus) embryophagus*, Hartig. Concerning 9 females of a species of *Trichogramma* bred from the eggs of *Mamestra brassicae* at Kiev, by V. P. Pospielov, the author is inclined to agree with Pospielov that the species is *T. semblidis*, but says that he could be more certain if he knew of the occurrence of wingless males, this being the only certain way of distinguishing *semblidis* from *minutum*.

TROÏTZKY (N. N.). О ЯЙЦЕѢДѢ-ПАРАЗИТѢ ВИШНЕВАГО СЛОНИКА [On an egg-eating parasite of *Rhynchites auratus*, Scop.]. Reprinted from *Jl. Agriculture of Turkestan, Tashkent*, no. 5, 1913.

The author reports on a parasite of the eggs of *Rhynchites auratus*, Scop., which he discovered in the spring of this year in Tashkent, this being the first time that a parasite of this insect has been observed. The peculiar mode of oviposition by the insect, the well protected larva, the quick development of the imago from the pupa, all appeared to preclude the existence of parasites and limited the possibility of their being discovered. At the same time the multiplication of the insect was limited by some unknown causes, and its numbers fluctuated widely during different periods; in 1912 about 88 per cent. of the eggs did not develop further, although the examination of the attacked fruits showed no faults in the protective constructions round the eggs, and they were found lying normally in the holes where they were deposited by the females. Only the external appearance of the eggs was different. The white, slightly yellowish, soft pellicle of the eggs had become hard and brown, and remained in this state during the whole winter in the laboratory at St. Petersburg. When the author arrived at Tashkent in the spring of this year, he found in an orchard underneath the trees and also on the branches cherry stones of last year with similar eggs which had wintered on the stones.

A microscopic examination of these eggs revealed, not the embryos of *R. auratus*, but the larvae of some unknown parasite. A little later the author found a female imago in a glass, in which he had kept the old cherry-stones found by him on the 18th April. From some other cherry stones, collected on the 29th April all the parasites had emerged. Thus it was established that the insects remained in the eggs during the summer, winter and into the spring of next year, being protected from bad weather, etc., after

the fruits had dried by the hard pellicle acquired by the egg. The parasites issue from the egg in the spring, and infect the eggs laid by the female of *R. auratus* a few days, or perhaps even a few hours, after the oviposition. No male parasite was obtained, and only one female.

The author describes the parasite and points out that it is similar to the insects of the genus *Oophthora* (CHALCIDIDAE) as described by Aurivillius. He is of opinion that he has discovered a parasite of *R. auratus* which is specially fitted to the conditions under which the eggs of this insect are laid.

The importance of the parasite can be judged from the great number of eggs (88 per cent.) which it destroyed in 1912, and the author suggests that it should be specially propagated for the fighting of *R. auratus*. He recommends that the stones of damaged fruits should be kept in boxes left in the orchards. The larvae of *R. auraths* issuing from the stones will perish, owing to the absence of suitable conditions for their pupation, while the parasite will emerge in the following spring.

TROÏTZKY (N. N.). КЪ БІОЛОГІИ ОЛЕНКИ ТУРАНСКОЙ [On the biology of *Tropinota turanica, Reitt.*]. Reprinted from the *Jl. Agriculture of Turkestan, Tashkent*, no. 6, 1913, 18 pp., 2 figs.

The Cetoniid beetle, *Tropinota turanica*, Reitt., is a prominent and regular pest of orchards in Tashkent. Its life-history has, according to the author, been but little investigated and the only reference to it that he was able to find was an article by Sokolov in the "Journal of Agriculture and Forestry" (Сельское Хозяйство и Лѣсоводство, 1894, no. 5). The bionomics of *Tropinota hirta*, Poda, found in great numbers in the southern parts of European Russia, where it is causing enormous damage in the Governments of Astrachan, Saratov, Charkov, etc., have been more fully described. According to Schreiner, the latter insect injures the blossoms of apricots, cherries, thorns, apples, pears, strawberries, etc., attacking only the unfertilised blossoms and eating away the ovaries, pistils, and stamens, but doing no great damage to the petals. The injury is done only by the perfect insect, the eggs being laid in the fields, where the larvae feed on roots of various plants.

The author describes fully the construction of the mouth-parts of *T. turanica*, and gives a figure showing details, as well as another figure showing the insect attacking the blossoms of pears. From the construction of its mouth, he deduces that it would be impossible for the insect to cause injury by gnawing fruit, as its maxillae are not capable of dealing with the hard skin. This deduction has been confirmed by further observations of which he gives a detailed statement. The insect appears in the orchards of Tashkent about the end of March, and observations show that it prefers pears to other fruit, and when these are present they attract more beetles than apple trees, even should the latter be in full bloom and the blossoms

of the former fading. The author has conducted experiments in the laboratory which confirmed the above distinction, and, besides, showed that on the blossoms of pears the insects chiefly injured the calices, whilst on apple blossoms the petals and leaves were chiefly attacked, and, in the case of black cherries, the ovaries and the stamens. A table summarising the results of the experiments is given. The author doubts the statement of Schreiner that *T. hirta* feeds only on unfertilised blossoms, and, according to his observations, this is not the case with *T. turanica*.

As preventive methods against *T. turanica*, some authors have suggested (1) poisoning by liquid sprays; (2) spraying with evil-smelling substances; (3) bee-keeping; (4) cultivation of tall-stemmed fruit trees; (5) covering the crown of the trees with cheese-cloth; (6) baits; (7) destruction of the larvæ; and (8) collection of the beetles by hand. All these methods are very ineffective and the best amongst them is the last-named. Schreiner has recommended methods aiming at the destruction of the insects by (1) construction of bait-heaps to attract the beetles to oviposit; (2) spraying with water; and (3) sticky traps of a blue colour. The last remedy consists of sheets of blue paper covered with some sticky material and laid about the orchards on the earth between the trees or suspended between them. There is some evidence that the insects visit these traps freely and can be destroyed later. Some growers have added various perfumed essences to the adhesive, such as oil of almonds; other evidence goes to show that the insects are attracted by a paste made from wine-worts. According to Schreiner, it is the blue colour which attracts the insects, but the author is not satisfied that that is the case, as the sight of most insects, and of Coleoptera especially, is very poor, and in searching for food they are directed rather by smell than by sight. The author cites also the evidence of one landowner who reports that the insects ignored his traps. The question, therefore, whether the insects are attracted by the blue colour, by perfume, or by wine-worts remains an open one.

According to Sokolov, *T. turanica* is found in Turkestan in great quantities during April and May, and single specimens are obtainable even in June. The author has not yet been able to observe this. The insects disappeared from the orchards at the end of April, when they were found on weeds. In the laboratory the insects began to die off on the 16th May. In the ovaries of the dead females mature eggs were found.

Troïtzky (N. N.). МАТЕРІАЛЫ ПО БІОЛОГІИ ВИШНЕВАГО СЛОНИКА [Materials for the biology of *Rhynchytes auratus*, Scop.]. Published by the Government Entomological Station of Turkestan. *Tashkent*, 1913, 49 pp., 2 pls.

The author gives a detailed description of this weevil, and points out the difference between it and the two related species, *R. bacchus*, L., and *R. giganteus*, Kryn. He further describes the larvæ and pupæ. In Russia the insect is found in the

southern and south-eastern parts of European Russia, in the Crimea and the Caucasus, and in the territories of Middle Asia. Lately it has been noticed also in the Government of Moscow, and the author found it on a wild cherry tree in the Aul of Nuchur, at Kopet-Dag, near the Persian frontier, at a height of about 4,000 feet, on 20th July 1912.

The insects appear in the orchards of Tashkent at the beginning of April. They winter in the imago stage, and the first few days after their exit from the earth the beetles keep on the lower parts of the stems of cherry trees, whence they gradually spread all over the crown of the tree, feeding on the blossoms and buds, and later on the fruits. They are very wary, and in case of suspected danger they drop to the earth, very seldom flying away.

The oviposition has already been described by Fabre, Sokolov, and Schreiner, and the author cites their descriptions, supplementing them by his own observations. According to them, the female gnaws a round hole in the pericarp, the bottom of which is formed by an excavation in the surface of the still soft stone, so that the stone is not actually penetrated. Having deposited the egg, the female, leaving a cylinder of pericarp round the hole, gnaws round this cylinder another channel, reaching to the stone, so that the cylinder is isolated from the surrounding tissue of the fruit; the hole in the cylinder is then filled by the female with fragments of the fruit through which air can reach the larvae. As the cylinder is quite isolated by the circular channel, the ventilating hole in it cannot be overgrown with new tissue and thus stop the access of fresh air, which is necessary for the life of the larva. This is the mode of oviposition on cherries; on apples or pears this laborious method cannot save the larva from suffocating, and, according to Schreiner, about [illegible] per cent. of eggs of *R. auratus* laid on these latter fruits do not develop further than to the larval stage; for the parenchyma of the pericarp, which has been destroyed by the insect, produces new corky tissue, which overgrows the egg and suffocates the larva. Other members of the same group such as *R. bacchus*, L., *R. cupreus*, L., and *R. aequatus*, L., which oviposit in apples, and *R. giganteus*, Kryn., which lays its eggs in pears, are, however, able to produce descendants, owing to the fact that they damage, at the time of oviposition, the pedicel of the fruit, so that it cannot grow any new tissue, but dries and drops from the tree.

In each fruit only one egg is deposited, each female laying about 150 eggs. The whole life of the beetles from their exit from the earth to their death is about $2\frac{1}{4}$ months (maximum life of one insect from 5th April to 26th June). The egg stage lasts about 10 days. The larva lives inside the stone, where it moults several times, and when mature passes into the earth for pupation. The larval stage lasts 20-30 days (?). The fruit grows and develops while the larva is inside the stone, and the insect may leave the fruit even while the latter is still on the tree. The maximum of oviposition takes place at the end of April and beginning of May; the exit from the fruits occurs in the early part of June. Having left the fruit the larvae pass

into the earth, to a depth of 1-2 inches, to pupate. Be... pupating they make a cocoon in the earth in which th... remain for some time. Pupation begins early in August. On the 16th August there were found in one orchard in the ea... 12 larvæ, 4 pupæ, and 5 imagos, all in cocoons. As to th... hibernation of *R. auratus*, some authors maintain that th... winter as pupæ and that the imago issues only in the follow... spring. Schreiner reports that in the Government of Sara... it winters in the larval stage; while Plotnikov states that it ... the imago which hibernates. This is also the opinion of th... author, who considers that the hibernation of the larva or pu... would be exceptional.

Schreiner reports that he has observed in the Governments ... the Volga that *R. auratus* were feeding on plums, aprico... apples, pears, prunes, thorns and even on gooseberries. It w... impossible for the author to make observations in the open, a... the few beetles observed fed only on cherries. But experime... conducted indoors showed that (1) on pears the insects feed ... the leaves and pedicels mostly, and only slightly on the fru... (2) on peaches they also feed only on the leaves and only ... egg was laid, but no channel is made round it; (3) on appl... they feed on the fruits, eating the parenchyma of the perica... and oviposit quite freely, 74 eggs having been laid, but no lar... developed. The author points out the conflicting nature of th... results. The insects refused to lay eggs on peaches (stone fru... and oviposited freely on apples (seed fruits). Correct expla... tions can only be obtained by further observations in natur...

In Tashkent the greatest amount of injury done to cher... is by the imago. The larvæ, although feeding on the kern... do not touch the fruit. The injuries done by the imago a... twofold, those due to feeding and those accompanying ovipo... tion. The first group of injuries affect the leaves, buds a... flowers in the spring, whilst the latter affect the fruit. Althou... the author has no evidence of the amount of damage done ... the insects to the leaves, &c., there can be no doubt that th... injuries make the tree weak and affect its utility. The inju... done to the fruit are theoretically not very serious, as th... are able to recover and can develop while the egg and larva ... inside, but the market value of the crop is appreciably lower... The author reports that in one orchard about 50 per cent. ... the fruits were affected on the 29th April, whereas on the 1... June there were 58 per cent. of fruits with larvae in them, ... per cent. from which larvæ had emerged, and only 12 per cen... were untouched. Approximately the same figures were obtai... in other orchards. The following remedies have been su... gested:—(1) spraying the trees with milk of lime, which it ... recommended to apply early in the spring, before the exit ... the beetles from the earth; (2) collection of the insects on th... stems of the trees on which they pass the first few days aft... exit from the earth; (3) spraying with Schweinfurt green (2... galls. of water, about 0·5 oz. of green, about 1 oz. of lime ... lumps, about ½-lb. of rye meal) when the insect starts feeding; the first spraying with the insecticide must be done before th...

blossoming of the fruits and then repeated 10-12 days later before oviposition has started; (4) during the same period it is also recommended to shake the insects from the trees; the insects are easily frightened and when they drop to the earth they can be collected and destroyed, but this method cannot be applied during hot weather, as they may then fly away instead of dropping; (5) the fruits infected by the insects ought to be picked and destroyed; (6) Sokolov recommends also digging up and ramming the soil at the period when the larvæ have passed into the earth; in this way a great number of pupæ will be exposed and be eaten by birds or destroyed by the weather; the majority of the pupæ left in the earth will also perish, as their natural position will be affected, so as to make their further development impossible.

Finally, the author suggests destroying the insects when all of them are in the earth, in the period from August to the following March, by poisoning them with the vapours of carbon bisulphide ($CS_2$). Usually when this insecticide is applied an injector is used to force the vapours into the earth, but, as the wintering stages of *R. auratus* are generally found very near to the surface an injector would be unsuitable. Instead of this, the author recommends the method proposed by A. A. Silvantjev as follows:—Round the stem of a tree, underneath which the insects winter, a cone-shaped tent is affixed. The upper part of the tent is bound round the tree, the lower part is spread out and the edge buried a few inches in the earth. The insecticide is placed in a vessel and put inside, it being better to put the vessel rather high up so that the vapours should be more equally distributed. Instead of a tent, when this is not convenient, sheet-iron boxes open at the bottom (galvanised iron is preferable) made in two or more sections to fit round the trunk of the tree can be used. These boxes can be put over a vessel containing carbon bisulphide, or the latter can be poured in by means of a funnel fitted with a cork and forming part of the box. The outer edges of the boxes should be driven into the earth. The amount of insecticide to be used, as well as the duration of saturation of the earth by it, must be settled by experiment. The author figures a sectional drawing of a tent and of a box in position.

SERBINOV (I. L.). КЪ ЭТІОЛОГІИ ГНИЛЬЦА У ПЧЕЛЪ [On the etiology of foul brood in bees].—СЕЛЬСКОЕ ХОЗЯЙСТВО И ЛѢСОВОДСТВО журналъ Глав. Управ. з. и з. ccxlii, pp. 367-382. *St. Petersburg*, July, 1913.

The author begins by pointing out the great importance of the question of the origin and spread of foul brood in hives, both from the scientific and practical points of view. He refers to his work, "The Foul Brood of Bees and the fight against it" (St. Petersburg, 1910), in which he has indexed the whole literature of

this subject, and to the work of F. Cheshire and W. W. Che... (*Journal of the Royal Microscopical Society*, 1885, Series II) and describes and compares the results of his own experiments during the last two years, and specially during the spring and summer of 1912, with the views of previous authors.

According to Schoenfeld the sources of infection are the honey-bearing plants, and the author, while not disputing this theory, remarks that it has not been proved experimentally, and besides it does not provide an answer to the question: What is the origin of the microbes on those plants? According to Bespalov, who doubts whether the honey-bearing plants play any part at all, the original infection spreads through the air, owing to the fact that the minute spores of foul brood thrown out from the hives are dispersed and carried by the wind to the honey or pollen, thus infecting the larvae through their food. The author, admitting the possibility of this mode of infection, again observes that neither has this theory been proved, nor does it supply an answer to the above question. In his opinion the problem was solved by him in 1911, when he obtained a new organism, *Bacillus butlerovii*, provoking foul brood, not only from the diseased brood, but also from dirty water in the neighbourhood of the apiaries at the Viritza station. It was remarkable that only the hives situated near the ditches filled with dirty water were infected. He repeated these investigations in the experimental apiary near Oranienbaum, which is situated near a small dirty pond from which the bees take their water, especially in the spring and at the beginning of summer, and when the bees developed the "European foul brood" he was able to produce the *Bacillus alvei* from the brood, as well as from the water of the pond. Thus the author has isolated two provokers of foul brood from dirty stagnant water, and he concludes that all forms of foul brood provoked by bacteria have their origin in the water taken by the bees from similar places. Bespalov agrees with the author and allows that most frequently the infection is produced in the way indicated, which is also confirmed by the statement of E. F. Fillips, to the effect that the "European foul brood" is most dangerous during the spring and the beginning of the summer, whereas it disappears at the end of the summer and in autumn. Another bee master, K. I. Shishev, reports that in the Crimea foul brood, which was playing havoc in the apiaries during the first half of the summer, disappeared in the second half, although an increase in the brood was noticed everywhere at that time. From the statements of the two last-named observers Bespalov concludes that, although it is not yet quite proved, the disappearance of the disease in the second half of the summer can be explained by the drying out of various pools of standing foul water which served previously as drink for the bees and helped to spread the disease.

The author reports observations of his own tending to confirm his view. He noticed in the spring that the bees fly first to gather pollen and then to the dirty water places, and specially to pools into which dung heaps drain: at this time there is in the hives a fair quantity of brood and nurse bees, and the young bees require

nitrogenous matters, warm water and mineral salts for their growth, all of which are absent from the hives in the spring. The pollen provides the nitrogenous matters, the dirty water supplies the mineral salts and the warmth, which it is necessary for the nurses to have to prepare the milk. Dirty water is warmer than clean, being more readily heated by the sun, and also because the putrefying processes going on in it increase its temperature. The author has experimented in this direction by putting both warm and cold water in the apiaries in the spring, when the bees took the warm water and did not visit the dirty water pools. When visiting the latter they take up the disease germs, and thus it is not the air but water which is the primary source of infection by bacterial diseases. With regard to diseases provoked by fungi such as mycosis of which the fungus *Aspergillus pollinis*, described previously by Howard, is the cause, the infection is air-borne, as these fungi are surface organisms. The spores of this fungus are always found on old wax in damp places, where, in the presence of sufficient moisture, they grow and produce new spores, which pass through the air into the cells to the pollen and honey, and from one hive into another. Actinomycosis of bees is provoked by *Actinomyces* which are found everywhere in nature: in water, in the air and in the earth, so that the infection by them may take place in various ways.

The author further deals with the actual mode of infection of the larvae. He quotes Cheshire, according to whom larvae are infected through the antennae of the nurse bees, which the author is prepared to admit, providing the primary infection (of the bees) takes place through the air; in this case Cheshire is, according to the author, even too cautious, for if the spores of the bacteria of foul brood are in the air, every bee coming into the hive and passing over a cell may be a carrier of infection, and the cells and the wax generally may be infected even before oviposition.

According to Harrison, the spores of the disease cannot be found in the air, as the sticky and even quite dry masses of dead larvae keep them fixed *in situ*. In the opinion of the author the mode of infection of the larvae is much simpler, and, assuming that primary infection proceeds through water, it spreads in the hive through the digestive organs of the nurse bees. He quotes M. Kustenmacher (Central. f. Bakt. Parasitenkunde und Infektionskr., 1900, xxiv, pt. 2), according to whom the water gathered by the bees is used in the hive exclusively to swell the pollen from which the nurses prepare the milk. The pollen is consumed by the nurses in great quantities, but owing to its having a hard skin they require water, and warm water, to make the pollen swell in their digestive tract. In the milk stomach of the nurses the pollen loses its skin, and there remain the so-called spermatoplasms—*i.e.*, the contents of the pollen grains, consisting of albumen, sugar and oil. This mass forming the milk is partly consumed by the nurse bee and partly given as food to the larvae. In this way, if the water brought by the bees contain the microbes of foul brood, the latter will pass

into the digestive tract of the larvae and cause infection. The author describes the following experiment conducted by him on the infection of bees by *Bac. butlerorii*. He charged two double-framed observatory hives (Dadan's pattern) with frames with broods and bees from a healthy hive. Although there was sufficient pollen and honey, some fresh good honey, previously boiled for 2½ hours, was poured into the hives occasionally. These hives were isolated from the apiary, there were no queens, but the bees were quite happy and fed the brood on the food in stock. In order not to allow the hives to cool down they were covered at night with blankets. Very soon part of the bees started to fly out, and the author then introduced, instead of the fresh honey, some water containing a 24 hours' bouillon cultivation of *B. butlerorii*, to which was added some sterilised honey. After two days the author examined the milk, and on 16 samples (agar-agar à la Maasen) he found the above bacteria, and in 6 days' time the larvae were attacked by "Butlerov foul brood" (this disease is described by the author in his article, "A new epizootic of bees in North European Russia," in Вѣстникъ Русскаго Общества Пчеловодовъ, no. 3, 1912). Examination of the digestive tract of the larvae proved the presence of great numbers of *B. butlerorii*.

Referring to the important question of the mode of the further and rapid spread of disease through the hives, the author attributes it to the honey, pollen, wax, frames and other appliances of beekeeping, to the movements of the bee-master, who may carry it through the whole apiary, and to the habits of the bees themselves. They usually clean out the cells of the diseased larvae, throwing out the dead bodies of the latter, and carry the disease through the hive, owing to small particles of diseased brood sticking to different parts of their bodies. The author has experimented on this subject by cutting away part of a frame with healthy brood and inserting a piece with cells of brood attacked by *B. alvei*, *B. butlerorii* and *B. brandenburgiensis*: after a few hours the bees began to clean out the diseased piece and through this infected the healthy brood, sometimes even on another frame, while the larvae in the immediate neighbourhood of the diseased piece remained healthy and grew quite normally. The air currents in the hive arising from the mass of working bees and from the ventilation also tend to carry the disease. An important part is in this respect played also by the nurse bees and by the queen.

The author quotes a statement by a practical beemaster, V. Kolodzeitchik, who noticed in 1911 that the nurse bees, while throwing out the diseased or dead larvae, always sucked out the milk from their internals; afterwards, when feeding the remaining brood, they undoubtedly infected them with the same disease. Bespalov has observed that on cold spring days the nurses devoured the brood infected by the disease, and thus were themselves infected and passed it over to the other larvae. The author further put frames with brood infected with *B. brandenburgiensis* into a large hive and noticed after a few hours that the bees were trying

to eject the foul brood. In a week the whole hive was attacked by "American foul brood"; he observed that the nurses sucked out the milk from the internals of the dead larvae. He continued this experiment through the whole summer, adding to the hive some healthy brood from the neighbouring hives and also some "flying bees," and he always noticed the same sucking of the larvae by the bees. The flying bees of the diseased hive were very dull and weak, and in their digestive organs were found *B. brandenburgiensis* and *B. alvei*. The author repeated this experiment in another hive with *B. butlerovii* and obtained the same results. Besides this he also made some experiments in Dadan's observatory hives with one frame, in which he put frames with a healthy brood and no flying bees sitting on them, and sprayed part of the brood in one hive with 5 cc. of a cultivation of *B. brandenburgiensis*, and in another hive with the same amount of a cultivation of *B. butlerovii*; his observations on these hives proved once more that the bees devour milk and suck the dead larvae before ejecting them. He found afterwards these bacteria in the digestive organs of the bees, but found no spores. He mentions that in the case of some bees in one of the hives he obtained from their digestive organs *Saccharomyces glutinis*, which microbe has no doubt pathogenic qualities, and he is of opinion that its influence upon bees ought to be studied.

He mentions that a whole set of experiments have proved that *B. brandenburgiensis* produces the typical form of foul brood on sealed, as well as on unsealed brood, which is also confirmed by some other authors (Kololev, Bespalov).

The author has also noticed that the nurses always lick the diarrhoetic excrements of the flying bees in the spring, on which excrements he found in one diseased hive many spores and rods of *B. alvei*. He further reports the following results of his observations on the part played by the queen in spreading the disease: (1) The nurse bees feed the larvae of the queens and thus infect them; (2) he found in the digestive organs of the queens of diseased hives, in their ovaries and eggs, both *B. alvei* and *B. butlerovii*, which confirms the statements of Harrison and of Mackenzie; (3) on the bodies of the queens which died in the observatory hives from the above two microbes he always found both of the latter, and he has been able to produce a cultivation of these microbes; this proves that the queen can pass the microbes to the larvae and can carry them about on the tiny hairs of her body; (4) he has noticed several times that the bees lick the excrements of the queen, thus becoming infected by the bacteria and carrying the infection further.

It is still not known what the activities and influence of the bacteria in the digestive organs of the larvae are, but the author points out that the whole aspect of feeding and digestion of the bees still requires to be studied. To provide some remedies against foul brood it is necessary to study more closely the morphology of the digestive organs of the bees and the physiology of digestion. At the moment he can only recommend the prevention of infection

by removing all pools of dirty water near the apiaries, supplying the latter instead with fresh, warm water, put about the apiaries in proper vessels. These remedies have proved effective in the author's apiaries against the importation of injurious microbes.

VASSILIEV (I. V.). ВРЕДНАЯ ЧЕРЕПАШКА И НОВЫЕ МЕТОДЫ БОРЬБЫ СЪ НЕЙ [*Eurygaster integriceps*, Put., and new methods of fighting it by the aid of parasites].—БЮРО ПО ЭНТОМОЛОГИИ Ученаго Комитета Глав. Управ. З. и З., iv, no. 11, 3rd enlarged edition. *St. Petersburg*, 1913, 81 pp., 31 figs.

Amongst the pests of crops in Russia, *Eurygaster integriceps*, Puton, deserves special attention, as during the last two or three decades it has caused immense devastation in Transcaucasia and in Transcaspia (in the provinces of Samarkand, Fergan, Syr-Daria, Khiva and Bokhara) and is known also in Caucasia; in European Russia it is found in some south-eastern Governments: Charkov, Saratov, Stavropol, Ekaterinoslav, to some extent in Voronezh and also in the Don-Province. Besides Russia, it is found also in Greece, Italy, Algeria, Persia and Asia Minor.

In Transcaspia *E. integriceps*, called by the native Turkomen "jasmuck," is the most serious pest of crops, next to the Morocco locust. In the years 1901 and 1902 it destroyed in some parts of the Territory the whole harvest of wheat. There are two breeding foci of the insect in Transcaspia; the first, the Askabad-Durun focus, is the larger of the two and runs along the Central-Asian railway line from the Aul Berum to Askabad; the second, the Ateck focus, is situated in the district of Tedjen. The natural conditions of these areas are very similar; both lie in the narrow strip of oases along the mountain chain of Kopet-Dag, being enclosed between the latter on the south-west and the sandy desert of Kari-Kumi to the north-east. The above strip is a woodless elevated steppe, only scantily irrigated by a few rivulets and "ariks." The insect is entirely absent in the other mountainous parts of the country.

In Transcaspia *E. integriceps* mostly injures winter wheat, the cultivation of which predominates in that country, while barley is damaged by it only to a very small degree; for owing to their early ripening, barley crops are cut in the first half of May. It feeds also on grasses and only occasionally on other plants. The insect appears in the fields in the first half of April; hiding during the colder weather underneath lumps of earth, it gradually becomes more active as the days grow warmer, and then keeps to the tops of the ears. The first pair of copulating insects was noticed by the author (in 1908) on the 7th April; on the 12th the first heaps of freshly laid eggs were found and oviposition was proceeding quite freely on the 17th and 18th April. As a rule, the eggs are deposited on the leaves of wheat, barley and grasses; only exceptionally were they found on the

stalks or ears of these and other plants. They are placed in regular lines on the upper and lower parts of the leaves, usually to the number of 14. The first groups of newly emerged insects were noticed by the author (in 1903) on the 1st May, while in the laboratory emergence took place earlier. Oviposition and hatching proceeded for a whole month, the duration of the egg stage in captivity being 10 days; at the beginning of May great numbers of insects in their first and second stages were found in the fields; the total number of moults is 5, the last stage appearing in the middle of May. By the end of May the fields are swarming with the adult insects. In the first half of June, when the time of wheat harvest arrives in Transcaspia, the insect gradually disappears from the fields, moving on to its wintering places. The author found the insects hibernating chiefly in the plantations around the "aricks" and in the orchards and gardens of the natives, where they select the more elevated, dry spots, not flooded by irrigation, hiding under fallen leaves, mostly near the trunks of trees. In Caucasia however, in the district of Achalkalak, in Tiflis, the conditions are quite different, and the insects winter there on the stubble in the same fields which they have devastated.

In European Russia the insect appeared in great masses in 1901-03 and again in 1909-11, in the south-eastern part of the Government of Charkov and in the neighbouring districts of the Government of Ekaterinoslav and the Province of the Don. The author's investigations have been conducted chiefly in the district of Kupjan, in Charkov. *E. integriceps* was always accompanied by *E. maurus* and *E. hottentotus*, the proportions of the three species being, in 1903:—*E. integriceps*, 88 per cent.; *E. maurus*, 10 per cent.; and *E. hottentotus*, 2 per cent.; while in 1912 the figures were, 74 per cent., 22 per cent. and 4 per cent. Owing to the cold weather in the spring of 1912, when the temperature at the beginning of May fell as low as 3° R. (39° F.), the spring migration of the insects was delayed. The first specimens in the fields near the woods were noticed on the 17th May. In 1912 the first oviposition in Charkov was registered on the 23rd May and the last one on the 23rd July. The hatching out of the first larvae takes place about the beginning of June, while the adults appear in the first half of July; so that the whole life-cycle occupies some 40 days. The migration of the insects to their wintering places begins with the harvest of rye and barley, those being the earliest ripening crops. In 1903, the author found specimens of the insects on *Onopordon*, *Carduus*, *Euphorbium*, millet, flax, sunflower and other plants unusual for them. The author has thoroughly examined some deciduous forests in the Government situated near fields injured by the insects and found that the latter were evenly distributed over the whole surface of the forests. The principal masses of the insects lay directly underneath the litter formed by the fallen leaves, etc., sometimes in the upper stratum of the soil and only partly among the leaves themselves. The smallest numbers of insects were found in spots where (1) there was no litter, this being superseded by grass, in glades or open places in the forests;

(2) the underwood was too thick; and (3) the litter was too wet. In 1912 the author found that in the cases of forests situated in valleys the hibernating insects do not evenly cover the whole wood, but concentrate near the margins and are totally absent in the deeper parts of the wood. This has a practical importance, as the insects may be combated by raking the fallen leaves over them in heaps and covering the latter with earth. His experiments have shown that even a stratum of less than two inches proves impassable for the insects, which die, without being able to get out, in less than a month's time. Pine woods are less favourable as wintering places for the insects than woods of deciduous trees, as in the former the fallen needles are blown away by the wind and remain only in such spots where the pines stand close together or in the lower-lying parts of the woods. In the spring the young crops are sucked by the insects near the ground, very seldom in the middle of the stalk or higher; the results of the injuries are similar to those produced by *Oscinis frit*. Later on, at the time of the blossoming, there appears another form of injury called by the author "white ear"; in outward appearance the damaged crops resemble those attacked by *Cephus pygmaeus* or by *Ochsenheimeria taurella*. Still later, the adults and remaining larvae suck the grain in the ears. Figures illustrating all the above-described forms of injuries are given.

Two Tachinid flies have been observed to parasitise this bug, *Phasia crassipennis*, F., and *Anantha lateralis*, Mg. The former fly is a polyphagous parasite, attacking various Rhynchota besides the species of *Eurygaster*, such as, *Carpocoris nigricornis*, *Mormidea baccarum* and *Aelia furcula*; while Dufour reports having obtained it from *Pentatoma grisea*. In 1903 the author observed the first specimens of *P. crassipennis* in Charkov in the second half of May; the first generation was on the wing for about three weeks, till the middle of June. The eggs (estimated at about 30) are laid on the back of the victim at the moment when the latter is alighting or starting to fly, *i.e.*, when the back of the insect is not protected by the wings. Usually one egg is laid, but sometimes more are found on one host. The parasitic larva gnaws its way into the abdominal cavity, where it remains during the whole of the larval stage. When fully developed, the larva issues from the host, which is sometimes still alive at the time, and passes into the earth to pupate. The whole development of the parasite occupies about 6 weeks, the pupal stage lasting 11-12 days. The second generation of flies appears in the first half of July. Only the first generation is able to infect *E. integriceps*. The second generation parasitises chiefly other insects, as the *Eurygaster* have then mostly migrated to their wintering places.

The author has observed the second species of these parasites, *Anantha lateralis*, Mg., in Transcaspia, although it is also known in South Russia and Western Europe. The first adult brood appears in Transcaspia at the beginning of April, and the second in the middle of May. The *Anantha* parasitises not only the adult *Eurygaster*, but also the larvae in their last two stages.

The author found from 69 to 93 eggs in the ovaries of females of the parasite. The eggs, larvae in their last two stages, and puparia are described; the pupa stage is passed in the earth and lasts 7-8 days.

There are five known species of parasites of the genus *Telenomus* (fam. PROCTOTRUPIDAE) infecting the eggs of *E. integriceps* and of *E. maurus*:—*Telenomus semistriatus*, Nees, *T. simoni*, Mayr, *T. sokolovi*, Mayr, *T. vassilieri*, Mayr, and *T. rufiventris*, Mayr. The author disputes the statement of Peneau ("Le genre *Eurygaster*," p. 162) that *T. sokolovi* is also a parasite of *E. integriceps*; he has bred it from the eggs of *Apodiphus integriceps*. He describes *T. vassilieri*, which was found by him in 1903 in Transcaspia, where it destroyed during that year 84 per cent. of the eggs of *E. integriceps*, while *T. rufiventris* was found by him in 1904 in the district of Rostov, in the Province of the Don, together with *T. semistriatus*. Usually one egg only is deposited in each egg of the host. Each female is able to lay up to 50 eggs, the oviposition being extended over 5-6 and more days (in the laboratory). The author's experiments have proved that in the absence of eggs of the three species of *Eurygaster* the parasites *T. vassilieri*, *sokolovi* and *rufiventris* freely infect the eggs of *Dolia furcula*, *Mormidea baccarum*, *Graphosoma lineatum*, *Carpocoris nigricornis* and *C. fuscispinus*, while they do not oviposit in the eggs of *Strachia oleracea*, *S. ornata*, *Pyrrhocoris apterus*, *Lygaeus equestris* and *Syromastes marginatus*; they also refused to oviposit in eggs of *Malacosoma neustria*, *Lymantria dispar* and *Euproctis chrysorrhoea*; the difference being due in the first instance to the form and size of the eggs and in the second instance to the character of their shells. The development of the parasites depends on the temperature, the average time for *T. vassilieri* being 12-13 days. The author obtained 7 generations of *T. vassilieri* during four months (April-August), and in his opinion *T. sokolovi* produces in nature more than four generations during one summer. Its eggs are found from the middle of May to the second half of August on various insect hosts. The females live only a short time after they have completed oviposition; but if this is prevented they may live as long as 14 months. The proportion of females to males is 5 : 1, and only a few females hibernate, most probably in the stubble of the fields.

The author further describes a Chalcidid hyper-parasite, *Encyrtus telenomicida*, Vass., which he has obtained from the eggs of *E. integriceps* infected by *T. sokolovi*, and gives an account of its life-history. They infect not only eggs of *Eurygaster*, but also those of other insect hosts, containing the larvae of *Telenomus*.

The last chapter is devoted to the methods of fighting the pest by means of its parasites, and the author points out that only the parasites of the eggs have a practical importance in this respect. The value of the parasitic flies is much less, for various reasons. They infect the pests after they have already done a great deal of harm; notwithstanding the infection the bugs

are sometimes able to oviposit and to continue their injurious activity; and finally, the difficulties of oviposition very often prevent effective parasitism.

The author further describes his experiment in transporting parasites, *Telenomus vassilieri*, from Central Asia to the Government of Charkov. He collected in April 1903 about 84,000 eggs of *E. integriceps* in Transcaspia, out of which number at least 34,000 (40 per cent.) were estimated to have been infected by *T. vassilieri*. He was not able to delay the development of the parasites in the eggs and had to transport them in the adult stage, keeping them in glass tubes (250-300 specimens in each), containing crumpled paper and with linen covers. He fed them on the voyage by moistening the linen with a solution of sugar in water. In this way he was able to bring about 12,000 specimens alive to Charkov (district of Kupjan) where they were released in two lots in the middle of June. His observations conducted on the spot during that summer proved that *T. vassilieri* had infected about 57 per cent. of the eggs of *E. integriceps* and *E. maurus*; that the parasite produced at least 4 generations during that summer and spread over a space of at least 73 acres, and that the fields in that locality have not suffered from the pest, though considerable damage was done on some neighbouring fields. The activity of the imported species was greater than that of the local one, *T. sokolovi*, which infected about 43 per cent. of eggs. [The accuracy of this estimate is questioned by some authors; see Dobrovolski below.] By this experiment the author also claims to have proved that it is possible to transport the parasites of the genus *Telenomus* over great distances (the distance in this instance was over 2,000 miles) and that when fed with a solution of sugar the parasites, especially the females which have no opportunity to oviposit, can live a long time (more than a year) without any other attention.

Dobrovolski (N. A.). НѢКОТОРЫЯ ДАННЫЯ О ПАРАЗИТАХЪ ЯИЦЪ ВРЕДНОЙ ЧЕРЕПАШКИ ВЪ ХАРЬКОВСКОЙ ГУБ. [Some information on the parasites of the eggs of *Eurygaster integriceps*, Put., in the Government of Charkov.] —"ЭНТОМОЛОГИЧЕСКІЙ ВѢСТНИКЪ" [*Messager Entomologique*], *Kiev*, i, no. 2, 1913, pp. 229–236.

The author starts with a short reference to the injurious activity of *E. integriceps* during the last few decades and its periodical disappearance, explained, although not wholly, by the destructive influence of its parasites, of which he mentions *Telenomus* (*Prophanurus*) *sokolovi*, Mayr, *T.* (*Aphanurus*) *vassilieri*, Mayr, *T.* (*Aphanurus*) *semistriatus*, Nees, and *Trissolcus simoni*, Mayr, and the Tachinid fly (*Phasia crassipennis*). He has also found an undetermined fungus disease which causes the death of the pest. He refers to the work of Vassiliev, and especially to the experiment of transporting parasites from Middle Asia, and corrects some of his estimates: the number of eggs infected by *Telenomus vassilieri* is not 57 per cent., as stated by Vassiliev,

but only 38 per cent., while *T. sokolovi* has been responsible for the destruction of only 28 per cent. of eggs and not 43 per cent.*

As to the future of the parasites imported by Vassiliev in 1903, the author's investigations in 1912 failed to reveal the presence of this species, and although he is not able to say definitely that it has disappeared, he is of opinion that its influence is nil.

Having referred to some observations made by him last year, the author reports having found some species of parasites new to the Government of Charkov—*T.* (*Aphanurus*) sp. n., and *T. semistriatus*, Nees; he also found *T. sokolovi*, Mayr, the presence of which has been known before. *T. semistriatus* and *T. sokolovi* were the most important, while the new species has been but slightly active. The proportion of infected eggs varied from 88 per cent. to 96 per cent.: *T. semistriatus* infected from 37·5 per cent. to 68 per cent., *T. sokolovi* from 26·7 per cent. to 50 per cent., and the new species from 1·3 per cent. to 8·8 per cent. The time of development of *T. semistriatus* in the laboratory was about 20 days.

*E. integriceps* oviposited last year up to the beginning of July. The normal number of 14 eggs in a cluster was seldom found; the numbers usually ranged from 9 to 11, and sometimes even less.

MOLINAS (E.). **Cochylis et Endemis.** [*Clysia* and *Polychrosis.*]—*La Vie Agricole et Rurale, Paris*, ii, no. 34, 26th July 1913, pp. 206-209.

This is a brief article dealing with the occurrence, anatomy, and life histories of *Clysia ambiguella* and *Polychrosis botrana*. The more common remedies are given, viz., light traps and alcohol baits for the moth, and spraying with arsenate of lead against the caterpillar.

TRUFFAUT (G.). **Nos ennemis les pucerons.** [Our enemies, the Aphidae.]—*Jardinage, Versailles*, iii, no. 18, May 1913, pp. 459-462, 5 figs.

This is a short account of aphids attacking chrysanthemums, rose-trees, wheat, salads, etc. The anatomy and physiology are briefly given, and some of the most efficient remedies.

CHASE (W. W.). **Principal Insects and Diseases of the Apple in Georgia.**—*Georgia State Board of Entomology, Atlanta, Bulletin* 38, May 1913, 58 pp., 10 pls.

The bulletin takes the form of a summary. Seven important insect pests of the apple in Georgia are described, viz., the Codling Moth (*Cydia pomonella*, L.), Plum Curculio (*Conotrachelus nenuphar*, Hbst.), San José scale (*Aspidiotus perniciosus*, Comst.), the Apple Aphids (*Schizoneura lanigera*, Hausm., and *Aphis pomi*, de G.) and the Apple Tree Borers (*Saperda candida*, F.,

* There appears to have been an error in the method of calculating the percentages.—ED.

and *Chrysobothris femorata*, F.). In each case the life-history, the adult, the egg and the larva is described, and the appropriate treatment given. Stress is laid upon the value of high pressure spraying of the blossom, by which means the liquid may not only impinge upon the corolla and calyx, but penetrate to their base, where the insect lies hidden; the insect is thus destroyed before it has penetrated into the fruit. The best results have been obtained with the use of a nozzle throwing a heavy coarse spray, at a pressure of 200-300 pounds. In the case of the Codling Moth, the liquid recommended is lead arsenate 2 lb., lime 3 lb., water 50 gals. A second spraying should follow quickly upon the first, and a third six weeks after the first. The first only is to be applied with the coarse nozzle. In the case of the Plum Curculio, lead arsenate is recommended as a spraying liquid 2 lb. to 50 gals. of water. High pressure spraying is desirable, and should be performed just after the blooms are off. As exterminators of San José scale, the standard solutions of lime and sulphur have proved unequalled. Soluble oil preparations and kerosene emulsion (of the former, notably Scalecide) have done excellent work. The manufacturers of commercial lime-sulphur generally recommend it to be diluted in the ratio of one part lime-sulphur to ten parts water. The more thorough the application the better the results, and one infested limb or twig left unsprayed by a careless sprayer may re-infest the tree. High pressure spraying should be maintained.

Against the Apple Aphid nothing has proved more valuable than dipping. The author completely rid a one year old apple orchard of a heavy infestation by this method, which is simple, rapid and more thorough than any spraying method could be. Good results have been obtained by the use of kerosene emulsion, whale-oil soap, tobacco decoctions, etc., and a manufactured product called "Black Leaf 40," a concentrated solution of nicotine sulphate. The latter when used as a dip has an efficiency of 100 per cent. as an aphis destroyer, and, in addition, has a stimulating effect on leaf growth.

The Apple-tree Borers are readily removed with a knife or killed by prodding into their channels with a sharp wire. The safest, surest method is to tap the channels and inject into them small quantities of carbon bisulphide, stopping up all entrances to the channel with wax to retain the gas. The fumes, which are deadly to the larva, penetrate into all parts of the tunnels and kill the larvae within; care must be taken not to bring the carbon bisulphide near a flame, as it is highly explosive.

HOUSER (J. S.). **Grasshoppers.**—*Ohio Agric. Expt. Station, Wooster, Ohio*, Circular no. 137, 9th June 1913, pp. 127-134. 10 figs.

The author says that grasshoppers sometimes become very abundant over a limited area in Ohio, and though the attacks never reach the proportions of those in the central and western States, they are nevertheless sufficiently serious to demand prompt measures of control. Several such outbreaks occurred within the

state last season, the principal ones being at Upper Sandusky, Berea and Athens. At the former place a crop of 14 acres of clover had been cut prematurely, in order to prevent its being a total loss, and at the time of the author's arrival the insects were turning their attention to oats, rye and corn crops on the neighbouring fields. Nevertheless countless numbers still remained in the clover stubble, subsisting upon whatever vegetation was remaining, the common broad-leaved plantain being the favourite food-plant. Chickens and turkeys were fed on the land, and although their numbers were considerable they made but little impression. The neighbouring crops were attacked to a very considerable extent. The rye was nearly ripe and the oats still green, but the insects, though preferring the oats, had eaten the rye to such an extent that fully one-third of the stems bore feeding hoppers eating away the heads, very few of which had escaped injury. A particularly pernicious form of injury was the eating through of the stem carrying the ear of grain. The corn crop was not so severely attacked. A subsequent survey showed that this particular grasshopper attack covered an area of about 25 square miles, though it was not uniformly affected throughout.

The so-called Hopper Dozer, which had been largely relied upon in the Western States for controlling grasshopper invasions, was used with considerable success. One and a half barrels of insects being captured by one apparatus in 6 hours. Poisoning by the use of "criddle" mixture was also tried with fair success. This mixture consists of 100 lb. of fresh horse dung, 2 lb. of salt and 1 lb. of Paris green, thoroughly mixed, and enough water added to make a sloppy mass. This was broadcasted at the rate of about 300 lbs per acre. The author reports that many of the hoppers were observed to have died from bacterial or fungus disease and that fully 30 per cent. of the living insects had within their bodies one or two specimens of the so-called hairworm or cabbage snake. He recommends the use of the dozer and criddle mixture, as above described, as good practical methods of destroying grasshoppers.

PADDOCK (F. B.). **The Life-History and Control of the Bee-Moth or Wax-Worm; Investigations pertaining to Texas Bee-keeping.**— *Texas Agricultural Stations, Austin (Texas), Bull.* 158, June 1913, pp. 15-30, 7 pls.

This account of the life-history and control of the bee-moth (*Galleria mellonella*) forms part of a bulletin on beekeeping in general, in Texas. The author states that the damage done by the bee-moth in 1911, according to the reports of 136 beekeepers, varied from 5 to 95 per cent. The distribution, habits and life-history of the moth are fully dealt with.

Of the natural enemies of the bee-moth the most important is the honey-bee itself, and it is well known that if the colony be healthy with a vigorous queen, only small damage is done.

A small red ant (*Solenopsis* sp.) has been found to be an enemy of the pest. The author states that many cage experiments were destroyed by the ant, which ate the larvae. Among hymenopterous parasites of the bee-moth the following have been

recorded:—*Eupelmus cereanus, Bracon brevicornis* and *Apanteles lateralis.* This last parasite was discovered by Conté in France. It is known to be parasitic on larvae of other moths in England and Germany. When introduced into the hive, it attacks only the bee-moth, leaving the bee untouched. Conté introduced it artificially into hives, with good results.

Fumigation is the only means of artificially controlling the bee-moth. This may be done with sulphur or with carbon bisulphide. Dry powdered sulphur (flowers of sulphur) is burned in the air and the combs are piled up over it. It was found that larvae, subjected to the fumes of quantities of sulphur varying from ¼ to ⅜ oz., for an hour, were killed. As a rule, unless the fumes are very intense, larvae which are in any way protected by webs are not killed; in any case the eggs are not destroyed. There are practical difficulties, too, in burning the sulphur, and as getting a high enough temperature to burn it efficiently, so that in practice the carbon bisulphide method is to be preferred. In using carbon bisulphide great care must be taken to keep it away from all lights as its vapour is highly explosive when mixed with air. Experiments were made with larvae, pupae and moths in different stages of development, and various quantities of carbon bisulphide were tried for varying periods of time. The results are tabulated. The quantity of carbon bisulphide used varied from ⅛ to ¾ oz., and the time from 15 minutes to 24 hours. In all cases the larva, pupa or moth was killed, even when well protected. Where eggs were present, they hatched out afterwards. It is thought that with extremely large doses the eggs also would be destroyed. The moths were the most susceptible to the poison; the pupae least so. Tables are given showing the approximate amount of carbon bisulphide needed with different numbers of supers, and for fumigating the hive bodies.

SCHOENE (W. J.). **The Influence of Temperature and Moisture in Fumigation.** *New York Agric. Exp. Sta., Geneva, N.Y., Tech. Bull.* no. 30, July 1913, 11 pp.

This bulletin discusses a series of fumigation tests with caterpillars of the brown-tail moth (*Euproctis chrysorrhoea,* L.) which were influenced by temperature and humidity. The fumigating material was cyanide. The experiments were carried on at different temperatures and in the presence of varying amounts of moisture. It was found that the caterpillars were more resistant to the poisonous fumes at low temperatures than at high: for example, at temperatures below 49° F., 66 per cent. of the caterpillars survived; while at temperatures above 59° F., only 25 per cent. survived. Also, it was found that fumigators under humid conditions were more destructive than those under relatively dry conditions; for example, when the difference between the wet and dry bulbs was between 10 and 17 degrees 56 per cent. of the caterpillars survived: while with a difference of only 3 to 6½ degrees, only 3 per cent. survived. It is suggested that these differences in results and the unusual resistance of the caterpillars to fumigations are due largely to the conditions incidental to

hibernation, viz., the reduced moisture content and comparative activity of the insects. In hibernation the animal is in a dormant condition and the poisonous gas enters the tracheae largely by diffusion, while in an active specimen the gas is drawn in by the movements of the segments. Changes in temperature probably affect the hibernating animal in several ways, but of most importance in this connection is the rate of metabolism and the resulting reflex movements. The rise of temperature increases respiration, and hence the injury is done at higher temperatures rather than at lower. As regards the action of the poison in the presence of moisture, it is suggested that when the tracheal walls are dry, the hydrocyanic gas is able to diffuse more slowly than when they are moist; it may also be due to the increased metabolism which accompanies increased moisture in the cases of a hibernating insect, though the author is inclined to attach less importance to the latter cause than to the former.

HARNED (R. W.). **The Cotton-Worm Situation.** *Press Circular, Mississippi Agric. Expt. Sta., Agricultural College, Miss.*, 29th July 1913.

In answer to the inquiry as to whether the cotton worm (*Alabama argillacea*) will prove as destructive this year as in 1911 and 1912, it is stated that the prospects are that in Mississippi there will be very few worms, and that they will arrive too late to do much damage. This year very few larvae have been received from Mississippi as compared with the numbers in 1911 and 1912. Small numbers have been found in Texas, but nowhere else.

SAFRO (V. I.). **An Investigation of Lime-Sulphur Injury; its Causes and Prevention.**—*Oregon Agric. Coll. Exp. Station, Research Bull* no. 2, July 1913, 32 pp.

The term "lime-sulphur injury" has been understood generally to include all forms of injury to fruit or foliage, following an application of lime-sulphur, and does not imply that the injury may be due to certain chemicals contained in the spray other than the lime-sulphur itself. The first explanation that occurs to a grower who notices leaf or fruit injury immediately after an application of lime-sulphur is that the spray was "too strong." The explanation would be simple were it not for the fact that, in several instances, under similar conditions a "weaker" spray has apparently caused injury where a "stronger" spray has proved harmless. Results of this character indicate that the strength of the spray is not the primary cause of the injury. Experiments were made on the foliage of potatoes, beans, and fruit trees, and the conclusion was arrived at that the injury was due to soluble polysulphides present in the mixture, notably calcium polysulphides and, to a less extent, calcium thiosulphate. A dozen samples of lime-sulphur all having the same specific gravity may show no two samples alike in percentage of soluble sulphides, and further, a sample having a low specific gravity

may have a greater percentage of soluble sulphides than a sample having a higher specific gravity. Thus the specific gravity alone of a lime-sulphur spray does not indicate to what extent sulphides are in solution, and different experiments, using the densities of different concentrations as bases for dilution, cannot be compared accurately, so far as the spray injury is concerned. The most simple method that presents itself of avoiding lime-sulphur injury is to weaken the soluble sulphides by increased dilution. Properly prepared lime-sulphur, only boiled for an hour, is not injurious at the usual strengths. On the other hand, commercial preparations which are boiled for 4-5 hours contain a much larger proportion of the soluble sulphides, and are therefore far more injurious. Another method is to render the sulphides insoluble, which may be done by adding various substances to the spray that will break down not necessarily all the sulphides but enough to render the remainder harmless. This however impairs the insecticidal properties of the spray. To a lime-sulphur solution of 1 to 20 (at 30° B) was added copper sulphate—4 lb. to 100 gals. of the diluted spray. The resulting precipitate consisted of sulphides of copper. No injury whatever was caused by this spray. The addition of zinc sulphate instead of copper was not so satisfactory. Another form of modified lime-sulphur was made by adding commercial sulphuric acid. The proportions were not accurately measured so that the result is only indicative, but although some injury was still caused, it is thought that only the addition of more acid was necessary to complete the harmlessness of the spray. The mere fact of the sulphur being in an insoluble form is not sufficient cause for considering the fungicidal and insecticidal properties to be impaired, as the sulphur itself is an active agent. Lastly, carbon dioxide was run into a 1 to 15 dilution of lime-sulphur, until the remaining polysulphides gave the solution a clear amber colour. The amount of gas used was not measured, so that this experiment, as the previous one, was qualitative rather than quantitative. No injury whatever was caused. Cases reported as lime-sulphur injury are frequently due to other causes, often sunburn, as is indicated by the locality of the injury in relation to the sun's rays.

OGLOBIN (A. A.). КЪ БІОЛОГІИ БОЖЬИХЪ КОРОВОКЪ [On the biology of Coccinellids]. (From the material of the Entomological Branch of the Agricultural Experiment Station of Poltava, with a preface by the Director of the Station, N. V. Kurdjumov.)—*Revue Russe d'Entomologie, St. Petersburg*, xiii, no. 1, pp. 27-43, 21 July, 1913.

In a short preface to this article N. V. Kurdjumov points out that although the work is a result of observations conducted by the author only during the summer of 1912 the questions dealt with in it are in some respects definitely solved. The work of the author is a continuation of investigations undertaken by the Station in Poltava on the biological factors regulating the multiplication of injurious grain aphids and has been conducted under his control and with his assistance.

The author dealing with the Coccinellid fauna in the Government, states that *Coccinella septempunctata*, L., is the commonest species, *Adonia variegata*, Goeze, coming second, while *Halyzia 14-punctata*, L., and *Hippodamia 13-punctata*, L., are less frequent.

The Coccinellids winter in the imago stage, chiefly in woods, under bark or fallen leaves. They awake with the first signs of spring and the beginning of their activity practically coincides with the emergence of the stem-mother aphids from the wintering eggs, which takes place for some species as early as the second half of April. The beetles then begin to fly to the corn-fields, though a considerable proportion always remains in the woods. The eggs are deposited in clusters, usually on the underside of the leaves, and generally near the colonies of aphids, on which the larvae feed. In the second half of July the number of ladybirds reaches its maximum; and after the harvest most of them return to the woods.

Many species of ladybirds have cannibalistic habits, and various instances are cited which have been observed not only in the laboratory but also under natural conditions.

The author goes on to consider the influence of temperature on the development of the different stages of the insects, the time for which decreases with the rise of temperature and reaches its minimum in the middle of the summer. Tables are given showing the results of experiments.

The last chapter is devoted to the parasites of ladybirds. During 1911 there was found a parasite of the imago stage, *Dinocampus terminatus*, Nees, and a short report on the biology was then published. In 1912 the first cocoon of the parasite, underneath a ladybird (*C. 7-punctata*) eaten out by it, was found in May; in July it was found more frequently; amongst the ladybirds collected on the 4th August 6 per cent. were infected; on the 9th of that month this figure was 5 per cent. and on the 15th August 10 per cent. This parasite was found less frequently on *Adonia variegata* and only once was its cocoon found in *Halyzia 14-punctata*. It is calculated that the parasite has 4-5 generations during one season. In captivity the adults lived about 20 days. *Dinocampus terminatus* behaves during the oviposition much in the same way as *Meteorus*. It follows the insects obstinately, keeping its ovipositor bent underneath its thorax, so that the end of it reaches the head of the parasite. Usually the egg is deposited between the segments of the thorax, sometimes between those of the abdomen and sometimes between the wing-cases. The developmental stages are described and figured. The presence of the parasite inside *C. 7-punctata* cannot be discovered from its appearance. The insects act and feed like normal ones, gradually losing the power of motion before the exit of the parasites. In the case of *Adonia variegata* the presence of the parasite is visible in the last stages of its development, as the abdomen of the host becomes swollen, though without affecting its activity.

Cases of superparasitism, *i.e.*, oviposition of several eggs on the same host, were frequently noticed in the laboratory as well as on hosts brought from outside, which contained several eggs

or larvae. Inside the body of the host were found sometimes larvae as well as eggs of the parasites, from which it is concluded that the larvae do not attack the eggs. On the 10th August 3 eggs were found inside a *C. 7-punctata* containing developed embryos, 1 healthy larva in the first stage, one dead larva in the first stage and one larva in the second stage. Another case is mentioned in which there were found inside one host, which died in captivity, as many as 60 eggs in various stages of development and also young larvae in the first stage. In such cases it is assumed that the larvae in the first stage, being equipped with strong mandibles, are the most likely to survive.

The male of the *Dinocampus* is unknown, and during two years not a single male was obtained at the Station, which coincides with Ratzeburg's observations. In 1912 the females laid unfecundated eggs and these yielded only females.

In 1910 there was found for the first time another parasite of *C. 7-punctata*, viz., *Tetrastichus coccinellae*, Kurdjumov; in 1911 only one pupa of the insect was found infected by that parasite, but in 1912 it was found more frequently. This parasite always infects the larva of the host, but issues from the pupa. In ovipositing the female of the parasite gets on the back of the larva and thrusts the ovipositor into the body up to the hilt. The females remain in this position some minutes afterwards, and removing the ovipositor drink the blood from the wound. This parasite lays several eggs in the body of one larva, which always succeeds in pupating. The development of *Tetrastichus coccinellae* lasts about three weeks. The adult larva of the parasite is described. Up till now it has been found only on *C. 7-punctata*.

On two occasions a Chalcid of the sub-family PTEROMALINAE was found associated with the *Tetrastichus*.

In 1912, 10 specimens of another parasite, *Homalotylus flaminius*, Dalm., were obtained from two larvae of *C. 7-punctata*. It is assumed that this parasite can breed poly-embryonically. The larvae of the host were unable to pupate. Ladybirds were also observed to be parasitised by certain species of worms, which were found on three occasions inside the beetles.

**Insect Damage to Russian Crops** [ИЗВѢСТІЯ ГЛАВ. УПРАВ. З. И З.], *St. Petersburg*, no. 30, 10th Aug. 1913.

According to the Crop Reports published by the Central Board of Land Administration and Agriculture in their weekly journal, up to 10th July 1913, very few injurious insects were noticed, and the damage done by them was nowhere very important. *Mayetiola (Cecidomyia) destructor*, L., appeared on wheat in many places in the Central districts, and in the Governments of Podolsk, Kiev, Taurida, Ekaterinoslav and Charkov, although no serious injury was done. The same applies also to the wheat chafer (Kyska), *Anisoplia austriaca*, Hbst., which appeared in many places on winter-sown crops, in the Governments of Orel, Voronezh, Kiev, Saratov, Penza, Little Russia and New Russia, but owing to the heavy rainfall its activity was evidently paralysed. Some serious damage was done by the larvae of

*Phlyctaenodes sticticalis*, L., to seeds of vetches, maize, beets, etc., in the Governments of Kursk, Kiev and Charkov, as well as in the Don Province. Peas suffered nearly everywhere from aphis, especially in the Volga Governments, Tambov and others. Sawflies were noticed in the Governments of Kiev, Bessarabia, Taurida, Vladimir, Jaroslav and Minsk, while *Thrips* sp. appeared in the Governments of Kiev, Penza and Vladimir. From some parts of New Russia came news of the appearance of locusts, which however fed mostly on grass and did not cause great damage.

As to Siberia and the provinces of Central Asia, locusts were reported from some districts of the Governments of Tobolsk, Yeniseisk and in the provinces of Akmolinsk and Semipalatinsk, where in some parts they passed from the meadows to the spring crops, mostly of wheat. Locusts were also reported from many other places, although the damage done by them was less. In the Government of Tomsk and the province of Turgai Elaterid larvae and those of *Euxoa segetum*, Schiff., were observed in some parts. *Anisoplia austriaca* played havoc with the crops, besides *Thrips* which also appeared there on wheat and winter rye. In the province of Semipalatinsk wheat was greatly damaged by *Mayetiola* (*Cecidomyia*) *destructor*, L.

In No. 39 (12th October 1913) of the same journal the following additional information is given: *Euxoa segetum* has done very considerable damage to crops in some Western Governments; in some places it was even necessary to repeat the sowings. The cold rains in August caused the insect to disappear. In the Western Governments some injury was caused by *Agrotis lunata*, L.

UVAROV (B. P.). ОТЧЕТЪ О ДѢЯТЕЛЬНОСТИ СТАВРОПОЛЬСКАГО ЭНТОМОЛОГИЧЕСКАГО БЮРО ЗА 1912 ГОДЪ [Report of the Bureau of Entomology of Stavropol for the year 1912]. *St. Petersburg*, 1913, 32 pp., 6 figs. (Published by the Central Board of Land Administration and Agriculture.)

Chief among the injurious insects of the Government are various species of locusts; the immense amount of damage done by the latter was possibly responsible for the establishment of the Entomological Bureau in 1912; a separate report on locusts and the fight against them in 1912 and during six previous years is in course of preparation.

The most wide-spread species of locust in the Government is *Stauronotus maroccanus*, *Thunb.*, the egg-masses of which have been recorded since the autumn of 1911 in 100,000 acres in one district only of the Government. Owing to the cold spring of the year under report the hatching out of the insects did not take place until the middle of May, which delay permitted the necessary precautions to be taken, and by spraying the infected area with a solution of Schweinfurt green and lime in water (at a cost of more than £5,000) the egg-masses were practically destroyed so that no damage occurred later to the crops. Next to *Stauronotus*, *Pachytylus migratorius*, L., is the most important species,

but in this year it appeared only at some places near Stavropol and was also easily destroyed. Notwithstanding the above measures, swarms of locusts invaded the Government in July, coming from the east or north. These swarms have destroyed in many parts crops of maize, millet, and grass; they have also done considerable damage to some vineyards; the insects do not devour the vine leaves but gnaw the tops of young branches, the petioles of the leaves and the grapes. Part of the invading swarms went over the Government into the provinces of Kuban and Don where they evidently oviposited; another part deposited its eggs over some 54,000 acres in the Government, chiefly in the steppes, and in cane-brakes on some of the rivers.

*Anisoplia austriaca*, Hbst., *Epicometis hirta*, Poda, and *Cephus pygmaeus*, L., have also done more or less serious injury to crops. *Aphis* appeared in great masses on various plants, prominent amongst them being *Toxoptera graminum*, Rond, *Sipha* sp. and *Brachycolus noxius*, Mordw., on barley; *Aphis padi*, L., *A. avenae*, F., on millet; and *A. euonymi*, F., *papaveris*, F., *rumicis*, L., on the panicles of maize. There were also recorded *Mayetiola destructor*, L., *Thrips*, larvae of ELATERIDAE, *Lema melanopa*, L., and *Phlyctaenodes sticticalis*, L., on melons, sunflowers and some vegetables.

Linseed crops were more or less damaged by *Chloridea dipsacea*, L., which has during the last 10 years led to a considerable decrease in the cultivation of linseed, and by some Halticid beetles; sunflower crops were partly injured by *Homoeosoma nebulella*, H.

Amongst orchard pests are mentioned: *Hyponomeuta malinellus*, Z., *Epicometis hirta*, Poda, *Cydia (Carpocapsa) pomonella*, L., *Aphis pomi*, de G., on apples and quinces, *Aphis grossulariae*, Kalt., on black currants, *Mytilaspis pomorum*, Bouché, on apples, *Lecanium* sp. on peaches, and *Anthonomus pomorum*, L., *Rhynchites bacchus*, L., *R. pauxillus*, Germ., *Sciaphilus squalidus*, Klug, *Apion pomonae*, F., *Eriocampa adumbrata*, Klug, *Zeuzera pyrina*, L., *Cossus cossus*, L., *Scolytus rugulosus*, Rtzb., *Cydia funebrana*, Fr., on apples and plums. The report points out that the orchards are mostly in a very neglected state and that no remedies against insect or fungus pests are generally applied, so that this branch of agriculture proves practically profitless.

The same applies in a certain degree to market-gardens which are damaged by many insects; *Gryllotalpa gryllotalpa*, L., being present in enormous numbers in some steppes, which makes the fight against them practically impossible: *Eurydema ornatum*, L., on cabbage, HALTICINAE, *Pieris brassicae* and *Plutella maculipennis* on cabbages, and *Aphis cucurbiti*, Buck., and *A. gossypii*, Glov., on cucumbers, are playing havoc with vegetables. The vineyards were damaged by *Ino ampelophaga*, as well as by locusts.

As to forest pests, *Melanophila decastigma*, F., and the caterpillars of *Sciapteron tabaniformis*, R., have caused serious injuries to poplar trees; the young trees were also damaged by the larvae of *Stauronotus maroccanus*, while poplars (*Populus alba*

on the River Kuma were injured by *Monosteria unicostata*, M.R.; ash trees were very much damaged by *Hylesinus fraxini*, F., the pest appearing in such quantities that it was impossible to fight it. *Robinia pseudacacia* was damaged by *Aphis laburni*, Kalt.; *Caragana arborescens* was injured by the same insect, as well as by *Macrosiphum caraganae*, Chol.

VITKOVSKY (N.). КЪ ПОЯВЛЕНІЮ ВЪ БЕССАРАБІИ ДВУЛЕТНОЙ ЛИСТОВЕРТКИ [On the appearance in Bessarabia of *Clysia ambiguella*].—Reprint from the journal "ВѢСТНИКЪ ВИНОДѢЛІЯ" [*Messenger of Viticulture*], no. 7, 1913. *Odessa*, 1913, 3 pp.

*Clysia ambiguella* appears in great numbers in different parts of south Russia: Bessarabia, Crimea, Caucasus, and the Government of Astrachan. The last two rainy years were very favourable for the development of the pest, which since 1911 has appeared yearly in Bessarabia in increasing numbers, and this year it has done considerable damage, especially in the vineyards near Kishinev. The insects preferably dwell and breed on vines trained in the Moldavian fashion, *i.e.*, in thick bushes affording plenty of shade, while on plants grown "en espalier" it keeps usually to small valleys and hollows and other damp places.

The following data relating to the development of the insect are given: The moths of the first generation appear in Bessarabia in the second half of April; the life of the moths lasts about two weeks, the development of the egg about 12 days, and the life of the caterpillars about four weeks; some caterpillars found on 7th June immediately pupated when taken to the laboratory. The moths of the second generation appeared in the laboratory from 27th June onwards. In nature the pupation and the flying of the second generation take place later and is very irregular and extended. The caterpillars of the first generation pupated—in the laboratory as well as in nature—in the bunches upon which they fed, without passing outside the knot of buds bound together by their webs.

Some vine-growers have successfully undertaken the collection of the caterpillars and pupae by hand. It was too late to spray the plants with Paris green or Djipsin. Owing to the rainy weather it is expected that the second generation will prove more harmful than the first one.

KRASSILSTCHIK (T.). ВЪ ВИНОГРАДНЫХЪ САДАХЪ [(Pests) of vineyards].—*Leaflet No. 5 issued by the Entomological Station of the Government of Bessarabia, Kischinev*, 18th August 1913.

This is one of a series of leaflets periodically issued by the Bessarabia Station, containing useful information and hints for agriculturists in relation to injurious insects and fungus diseases of plants. They are issued in Russian and Moldavish.

The part pertaining to vineyards is devoted to *Clysia ambiguella*, which has appeared this year in extraordinary numbers

in some parts of the Government. Usually the caterpillars are so scarce there, that it is not easy to find them. The author describes the damage done to the blossoms by the first generation and the injury to the grapes effected by the second. The active injurious life of the second brood lasts only five to six weeks, after which they enter crevices of the bark of the older branches of the vines, or some other sheltered place, in which they pass the winter, having previously covered their refuges with a web, and pupated.

This time is the most convenient for destroying the insects, pouring boiling water over them, by scraping them down with various mechanical appliances, or by cutting away parts of the branches and burning them. As to remedies against the first generation of caterpillars while they are attacking the blossoms of the vine, the spraying of various arsenical substances is not considered to have proved successful, and it is recommended to apply the method of hand-collection and destruction. There are no means known by which to fight the second generation of caterpillars while they are actually devouring the grapes, and it is recommended to catch the moths in the evenings by fixing poles in the vineyards with cans containing fermenting liquid (beer residues, sugar water with yeast, etc.) and lanterns suspended above them.

As to orchards, the leaflet contains general suggestions for remedies against *Cydia (Carpocapsa) pomonella*, such as band belts, etc.

Sopotzko (A.). ЧТО ТАКОЕ ОЗИМЫЙ ЧЕРВЬ И КАКЪ СЪ НИМЪ БОРОТЬСЯ [*Euxoa segetum*, Schiff., and how to fight it].—*Published by the Entomoligical Station of the Zemstvo of the Government of Tula, Moscow*, 1913. 11 pp., 2 figs., 1 pl.

This is a popular description of *E. segetum*, its life-history, diseases, parasites, and methods of fighting it, issued at a nominal price (1¼*d.*) to secure general distribution.

*Euxoa segetum* is declared to have destroyed in 1909 about 270,000 acres of crops in the Government of Tula; and much damage has been done by it in some neighbouring Governments.

Amongst the natural enemies of the pest are mentioned flacherie, a disease caused by the fungus *Tarichium* [illegible]*spermum*, Chor., and insect parasites, notably Tachinid flies. Figures are given of *Ophion luteus*, F., and of *Gonia cap*[illegible], de G. Attention is also drawn to birds (rooks and starlings) which destroy the caterpillars, and it is stated that in localities frequented by rooks damage is never very great.

The remedies recommended are: (1) to keep the fallow land clear of mud, by early ploughing (not later than May), etc.; (2) the sowing of vetches, with oats or with mixed grasses, after the removal of which the stubble must be at once re-ploughed; (3) in case the above remedies cannot be applied it is suggested to use at about 2 weeks before the sowing, baits of potatoes or weeds, on one portion of the land, keeping the remaining portion clear;

(3) when the caterpillars have appeared the attacked portions of the field must be divided from the rest by a trench with vertical sides, 7″ deep; (4) to put troughs containing molasses and water round the fields as soon as the moths appear (about the end of May); the cost of this method for 270 acres of fallow land is calculated to be about 16*s*.

By applying the last method in 1910 on one estate about 30,000 moths were destroyed.

Vassiliev (Prof. E. M.). **ОБЪ ОДНОЙ МѢРѢ БОРЬБЫ СЪ МОРКОВНОЙ МУХОЙ** [On a method of fighting *Psila rosae*, Fabr.].—Reprinted from the journal "САДОВОДЪ И ОГОРОДНИКЪ" [*The Horticulturist and Market Gardener*], *Kiev*, 1913, 6 pp.

This is a leaflet giving in a popular form some information on the life-habits of this insect and on one remedy against it. In Russia the "carrot fly" is found in the neighbourhood of St. Petersburg and Moscow, and in the Government of Mohilev and Poland. The author found it also in one district of the Government of Kiev, and apparently it occurs also in the Governments of Volhynia and Podolia. The insect flies twice a year, in April and May, and again through July and early August. The eggs are laid on the beds of carrots, from which the larvae get into the roots of these plants. The author noticed only straight worm-holes, not sinuous ones, as usually reported, and parallel to the length of the roots. The larvae leave the roots throughout June to pupate. The flies issue at the beginning of July or in August, and late in August the larvae appear again. Although it is usually understood that the insects winter in the pupal stage, the author found in the cellar of his house on the 1st January 1913 in roots of stored carrots some larvae of *P. rosae*. He suggests as a remedy catching the flies in May and in June in molasses, dissolved in water, to which ordinary beer yeast is added. Vessels with this liquid ought to be put on the beds and in the cellars, where the newly emerged flies are to be found. The roots damaged by the insects should be put into boiling water, to kill the larvae, after which they may serve as food for cattle. In this way the number of the insects of the second generation will be decreased. To destroy the pupae in the earth of the beds, the latter must be dug over in autumn.

Jemmett (C. W.). **Notes on the chief Insects affecting Forest Trees in Great Britain.**—*S.E. Agric. Coll., Wye, Kent*, N.D. (1913), 44 pp.

The author gives the following as the most important insects injurious to forest trees in the United Kingdom:—

Lepidoptera: Goat Moth (*Cossus cossus*), Winter Moth (*Cheimatobia brumata*), Mottled Umber Moth (*Hybernia defoliaria*), Brown-tail Moth (*Euproctis chrysorrhoea*), Black Arches (*Lymantria monacha*), Green Oak Tortrix (*Tortrix viridana*), Larch Coleophora (*Coleophora laricella*).

COLEOPTERA: Common Cockchafer (*Melolontha vulgaris*), Pine Weevils (*Hylobius abietis* and *Pissodes notatus*), Pine Beetle (*Hylurgus piniperda*), Spruce Bark Beetle (*Tomicus typographus*), Ash Bark Beetle (*Hylesinus fraxini*), Elm Bark Beetle (*Scolytus destructor*).

HYMENOPTERA: Steel Blue Wood Wasp (*Sirex juvencus*), Giant Wood Wasp (*Sirex gigas*), Pine Sawflies (*Lophyrus pini* and *Lophyrus rufus*), Large Larch Sawfly (*Nematus erichsoni*), Douglas Fir Seed Fly (*Megastigmus spermatrophus*).

HEMIPTERA: Spruce and Larch Aphis (*Chermes abietis laricis*, *Chermes piciae*, *Cnaphalodes strobilobius*, *Pineus strobi* (*Chermes corticalis*), *Pineus pini*, Willow Scale Insect (*Chionaspis salicis*), Felted Beech Coccus (*Cryptococcus fagi*).

The paper concludes with a list of preventive measures against insect attacks:—

(1) Preserve, where sporting considerations permit, such enemies of injurious insects as bats, moles, hedgehogs, weasels, stoats and most song-birds (especially the cuckoo, which is the only bird to devour hairy caterpillars); the erection of nesting boxes for starlings, titmice, etc., is helpful in this direction; (2) carefully consider the soil, situation and climate before deciding the species of tree to grow; (3) form mixed plantations in preference to pure, as there are more insectivorous birds in mixed than in pure woods, and the danger from gales, snow, fire and fungoid disease is less; (4) examine the woods carefully and frequently, so as to anticipate the death of a tree, and have it removed before it is actually in a fit state to be appropriated by the insects; (5) carefully thin out at once all sickly stems; (6) bark all conifer logs left lying in the woods after April, and burn the bark; (7) grub up the stumps of conifers, where possible, before re-planting; (8) where felling in winter is practised, ring and leave standing a few stems here and there as decoys in order to attract bark beetles; fell and bark these, and burn the bark in order to prevent the ova and larvae developing into mature insects and multiplying; (9) remove as soon as possible all thinnings and falls of timber, and clear away all the branches and brushwood; (10) make good as soon as possible any damage occasioned by wind, snow or fire in the wood; (11) timber which is designed for estate work and is carried to the sawmill should be peeled or cut up, and in the latter case the slabs should be burned or peeled; (12) cut the trees as close to the ground as possible; (13) burn all bark where peeling is done.

JACK (R. W.). **Termites or "White Ants."**—*The Dept. of Agriculture, Bull. no.* 139, *Salisbury, Rhodesia*, Feb. 1913, pp. 1-16.

The injuries due to termites are divided under three heads:—(1) Injury to dead wood; (2) injury to living trees; and (3) injury to stacked and standing crops.

As preventative dressings against injury to dead wood, only those containing soluble arsenic have been found to be any good. Coal tar on account of its feeble power of penetrating the wood

is not alone a safe preventative. The arsenical preparations which have been successfully used are the following (taken from the Transvaal Agricultural Journals for Oct. 1907, April 1909, and Oct. 1909):—(1) Arsenite of soda, 10 per cent. solution—*i.e.*, 1 lb. to each gallon of water; (2) Atlas preservative, full strength; (3) Atlas preservative, 10 per cent. solution; (4) Demuth's dip, 10 per cent. solution; (5) Cooper's dip, 1 pint to 9 gals. water; (6) Alderson's cattle dip, 4 lb. to 8 gals. water. The wood was soaked for 24 hours, or soaked for 24 hours and boiled. Tests were also made with the Atlas preservative by giving the wood one or two coats with a brush. Wood so treated resisted termite attacks for 3 years. The following preparations failed to make the wood resistant for 3 years:—Street's white ant cure, coal tar (one coat), Stockholm tar, creosote, solignum, asphenite, crude carbolic acid, Jeyes' fluid, carbolineum, various tobacco extracts, various paints, oils, soaps, etc. Copper sulphate in saturated solution protected wood for three years, but weaker solutions failed. Methods involving the use of the brush have advantages over methods involving dipping the whole piece of timber into a receptacle containing the fluid. Ends of timber that are to be inserted in the ground can be soaked in a barrel and then given a coating of coal tar—the coal tar prevents water reaching and dissolving out the poison. Arsenite of soda is the cheapest of the above-mentioned remedies. It is important to coat all possible inlets for the termites into the wood, such for example as mortices or other joints cut in the wood after it has been dipped or painted, and any holes left by removal of nails, etc. As a result of experiments to see whether one wood was more resistant than another to termite attacks, it was found that only two were untouched at the end of three years, *viz.*, leadwood (*Combretum porphyrolepis*) and black ironwood (*Olea laurifolia*). Vaalbosch (*Brachylaena discolor*) was untouched for two years, but was attacked during the third year. In Southern Rhodesia the wood of the Mopani tree (*Copaifera mopani*) is found to resist termite attack for years; it is suitable for fencing or straining posts, but it is not a timber that can be cut and squared.

Remedies against termites which have already made some inroad into timber consist in locating the nest, and destroying it by means of the machine known as the Universal Ant Destroyer. This machine generates a poisonous gas which penetrates into all the ramifications of the nest and kills the ants. As a further preventative, all brick buildings on land where termites occur should have a "zinc ant course," *i.e.*, strips of zinc laid on the first course of bricks over the whole foundations and projecting at least one inch on each side of the wall; this effectually prevents the termites from ascending the wall.

Remedies against termites attacking living trees are not many, and all are expensive to use as they require frequent renewal. The following remedies are given:—Copper sulphate, 1 lb. in 50 gals. water; weak solutions of Jeyes' fluid or carbolic acid; tobacco water, tar water, soap solution, etc. Tobacco dust round the trees is a temporary expedient. These preparations are not recommended to the commercial planter, but are useful in cases

where there are only a few trees to protect. Experiments were made in connection with certain species of termites which have the habit of ring-barking fruit trees just above the ground, and as a result it was found that a band of coal tar, 8 ins. above the ground was satisfactory. As in the case of timber infested by termites, the Universal Ant Destroyer is the best weapon against attacks upon trees, this being better than poisoning by carbon bisulphide. Poisoned bait is another remedy: the formula usually adopted is that used against cutworms:—1 lb. of an arsenical compound, 8 lb. of treacle or black sugar, and 10 gals. of water. Arsenite of soda is the cheapest arsenical compound, but as this is soluble in water, it must not be used near the fruit trees. In view, however, of the extraordinary fecundity of the queen, poisoning the workers, even the majority of them would not by any means destroy the pest, and in any case, it is not to be supposed that the majority of the workers will fall a prey to the poison. Putting the poison actually into the nest would have better results. The trees most susceptible to attack are plum, apple, apricot, and fig, and citrus trees in Southern Rhodesia. Peach trees, if healthy, are stated to be safe in Natal, but, according to the author, a tree in Salisbury was attacked.

As regards injury to standing crops, this is due to "harvesting" or "marching" termites [*Hodotermes*], which differ from other termites in having functional eyes and in carrying out their work in the open. These can also be killed by the Ant Machine, while they are working, by inserting the funnel of the machine into the hole into which they are carrying the forage. At other times the passages are closed and impervious to fumes. A layer of wood ash, several inches deep on the ground to be used for the stack has had good results, according to a Rhodesian farmer, in keeping the ants away from the stack. The layer was formed by burning the wood on the spot.

BLAIS (M.). **Insectes Nuisibles. Influence des conditions météorologiques sur la multiplication de quelques insectes.** [Harmful Insects. The influence of meteorological conditions on the multiplication of certain insects.]—*Jardinage, Versailles*, iii, no. 17, April 1913, p. 430.

A short article upon the way in which climatic conditions, temperature, moisture, etc., affect the propagation of insects. For example, the cold summer of 1911 proved fatal to the vine pest, *Clysia ambiguella*, and its second generation passed almost unnoticed. In the case of the cabbage moth, the absence of heat during the summer prevented the escape of the moth from the chrysalis, and the usual large numbers of moths were not seen. Owing to the rains of the autumn in 1910 the valleys were flooded, and the larvae of *Cheimatobia brumata* were suffocated, and only very few moths emerged in November and December. Observations were also made upon *Hyponomeuta*. These moths emerge in July, August, and September, but the low temperature which prevailed during these months was unfavourable to fertilisation and very few eggs were laid.

Cox (H. R.). **Oriental Pears and their Hybrids.** *Cornell Univ. Agric. Exp. Stn., Ithaca, N.Y., Bull.* no. 332, May 1913, pp. 438-488, 17 figs., 1 pl.

This bulletin, which gives the results of experiments made at Ithaca upon the Oriental pear (*Pyrus sinensis*), its cultivated varieties, and the hybrids between it and the common pear (*P. communis*), contains a short account of the insect pests of these trees, of which the following are the more important: those injurious to the trunk are the pear tree borer, scurfy black louse, and the San José scale; those injurious to leaves are the pear tree slug, blister mite, and pear tree psylla, those injurious to the fruit are the pear tree midge, codling moth, and plum curculio. The last two are the worst pests. Other insects of less importance are the round-headed and flat-headed apple-tree borers, oyster-shell scale, pear lecanium, and pear blight beetle. Except in the case of San José scale, there is not sufficient evidence to show whether any of the above-mentioned insects are more or less injurious to Oriental pears than to common pears. Oriental pears, however, have been found free from scale, while common pears standing near them have been destroyed. Professor J. B. Smith of New Jersey reports that " Kieffers " alone are absolutely exempt and, closely following, the " Le Conte," which is rarely infested in the nursery and never in his experience, in the orchard. One tree grafted with Lawson and Kieffer had the Lawson branch and fruit covered with scales, while the Kieffer was entirely free. The Oriental pear is native to the countries where this insect has existed for centuries, and it is reasonable to expect its hybrid descendants to resist the pest better than can other species never before exposed to its attacks. Observers have reported that the scale has failed to establish itself on certain hybrid trees that have been repeatedly infested artificially. But although it would seem that certain hybrid trees are immune, this cannot be maintained for the whole race. While the Oriental hybrids, as a race, are not immune to the scale, certain trees seem to resist it very effectively. This points to a line of possible usefulness in breeding hybrid trees that are practically scale-free, by selecting buds and grafts from resistant trees.

Patch (Edith M.). **Aphid Pests of Maine: Willow Family.** *Maine Agric. Exp. Stn., Orono, Bull.* no. 213, June 1913, pp. 73-100, 25 figs., 4 pl.

This bulletin contains a descriptive list of Aphid pests on trees of the willow family in Maine, together with collection data of pests on corresponding trees in other parts of the world. The following pests are described:—*Pemphigus populimonilis*, Riley; *P. populiconduplifolius*, Cowen; *P. populicaulis*, Fitch; *P. bursarius*, L.(?); *P. gravicornis*, sp.n., *Chaitophorus populicola*, Thomas; *C. viminalis*, Monell; *C. delicatus*, sp.n., *Aphis salicicola*, Thomas; *A. populifoliae*, Davis; *Macrosiphum laevigatae*, Essig; *Melanoxantherium bicolor*, Oestlund; *M. salicti*, Harris; *M. smithiae*, Monell; *M. salicis*, L.; and *M. antennatum*, sp.n.

The life-history of certain gall-forming species of the poplar is not known, but the fact that *Pemphigus betae* is known to winter on the cottonwood, suggests that other pests on the willows and poplars may change their host periodically, and plants of economic importance may serve as the alternate host. The paper is accompanied by a food-plant catalogue of the APHIDAE of the world, and is illustrated by 4 plates and diagrams.

FULMEK (L.). **Zur Arsenfrage in Pflanzenschutzdienst, besonders betreffend das Bleiarseniat.** [Arsenical Insecticides with special reference to Lead Arsenate.] — *Sonderabdruck aus Archiv für Chemie and Mikroskopie*, 1913, Heft 6. *Mitteilung der k. k. Pflanzenschutz Station in Wien*, 62 pp.

Dr. Fulmek in this paper deals largely with the chemistry of the various arsenic preparations used for destroying plant pests, and has classified the literature on the subject under different headings, corresponding with the different compounds of arsenic which may be used. The article does not deal with specific remedies for particular pests, but with the chemical nature of remedies, in virtue of which they are useful, or dangerous. The author describes shortly the methods used in different parts of the world in dealing with arsenic compounds, and the conditions for their use laid down by the law in these countries.

The bibliography occupies no less than 38 pages—more than half the entire paper—and under each entry the composition of the preparation most recommended is given.

FULMEK (L.). **Die Kräuselkrankheit (Akarinose) des Weinstockes.** [Mite Disease of the Vine.]—N.d., 32 pp., 4 pls., 12 figs.

The disease of vines which has been called "Akarinosis" is the cause of very considerable loss. It has a very wide distribution, including France (where it is known as court-noué) Switzerland, the Rhine, Portugal, Sicily, &c. The symptom which is most characteristic, is the stunted growth due to a shortening of the internodes; and it has been shown to be caused by the presence of a mite. The mites are quite invisible to the naked eye, and can only be seen and identified in special preparations under high powers of the microscope. The leaf stalk is, in such a preparation, removed from the leaf: the leaf is pressed between two glass slides and its underside is examined. Numerous, whitish, worm-like little animals are seen in the angles of the principal veins. They are at first sight hardly distinguishable from the common vine-leaf pest, *Eriophyes vitis*, Nal. They are shown however to belong to a different species. On account of the difficulty of identification, the k. k. Pflanzenschutzstation, Vienna, undertakes the examination of material free of charge.

Regarding the particular species of mite, there has been a certain amount of controversy. Faes and Müller said it was

identical with *Eriophyes vitis*. In 1905 Chodat described it as a new species, and called it *Phytoptus bullulans*. Nalepa about the same time described it as *Phyllocoptes vitis*, Nal., and in 1909 Burnat and Jaccard discriminated two forms, *Epitrimerus vitis*, Nal., and *Phyllocoptes vitis*, Nal. The author found *Epitrimerus* in all material collected in the summer, and is convinced that the disease, in summer at least, is due entirely to *Epitrimerus* and not to *Phyllocoptes*.

As regards the spread of the disease, very little is known for certain. The mites are observed to migrate from one plant to another, and often appear in a vineyard for the first time attacking solitary plants here and there. On account of the great damage caused by the pest, it is earnestly asked that all facts relating to symptoms shall be watched for, and that, in the view of the extreme ease with which it spreads, every precaution to combat it shall be taken.

In 1912 experiments were carried on under the Vienna Pflanzenschutzstation, with the object of testing the value of different remedies. These experiments were made at Herzogenburg, Eggenburg and Kottingbrunn. The remedies used were as follows:—Polysulphides of alkalis or liver of sulphur in 3 per cent. aqueous solution; lime-sulphur mixture diluted with 2, 3 or 5 parts of water; Dendrin in 4 and 5 per cent. aqueous emulsion; Demilysol in 4 per cent. and 5 per cent. aqueous emulsion.

The vineyard experimented with in Herzogenburg had 9,000 plants (Neuburger-Riparia), planted in 1908. The disease attacked the vine in 1911, and in the autumn the plants were treated. Shortly, the results were as follows: Demilysol proved useless; Dendrin was rather better; the lime-sulphur mixture acted very well, and best of all the liver of sulphur. In Kottingbrunn 49,800 plants were dealt with, including several different varieties; in this case the lime-sulphur treatment gave the best results, one in three of the plants escaping the disease altogether. In Eggenburg 7,659 plants were treated. It was found that spraying the underside of the leaves with the lime-sulphur mixture gave very good results, infected leaves and shoots becoming again quite normal, and growing as it never infected.

The author summarises his results as follows: (1) lime-sulphur mixture is the best remedy. On account, however, of the ease with which the use of liver of sulphur can be controlled, the plants clearly showing whether it has been properly distributed or not, this has great advantages as a remedy. After having been painted with the solution of liver of sulphur a greyish stain is left on the leaf. (2) If diseased plants appear in the summer, it is essential to deal with the whole plot early in the following spring, as it is then that the means of spreading the disease are most potent. (3) If the disease is only observed for the first time when the vines are in bud, the stem, shoots and all the old wood must without delay be thoroughly sprayed with lime-sulphur mixture (1 pint of the mixture to 5 gallons of water) and it must be continued until the old wood is soaked with the liquid.

The paper contains photographs of the vine showing various stages of the disease, and photo-micrographs of the mite on the leaf.

FULMEK (L.). **Die Schwefelkalkbrühe.** [Lime-Sulphur Mixture.] —*Mitt. der k. k. Pflanzenschutzstation Wien*, n.d. (1913), 9 pp.

This memoir deals with the preparation and use of lime-sulphur mixture, and its effect on pests. The author says that the following may be taken as an average of the proportions of the materials used in its preparation, based on various well-known formulae:—Quick lime 1, sulphur 2-2¼, water 9-11; all parts by weight. The three following formulae are in general use:—(1) American formula—Water 100, sulphur 19·175, quick lime 8·628-9·587; (2) formula used in Hamburg commercial preparations—Water 15, sulphur 2·2, quick-lime 1·3; and (3) Italian formula (Savastano)—Water 100, sulphur 20, quick-lime 10; all parts by weight.

Lime-sulphur mixture is relatively very cheap, more so than the lime-copper mixture. The materials for 1 hectolitre (19 gals.) of concentrated liquid costs 5*s*. to 10*s*.; 1 hectolitre diluted for winter use costs about 1*s*. 8*d*. to 2*s*. 6*d*., and diluted for summer use, costs about 4*d*. to 6*d*. Savastano reckoned that according to his formula 1 hectolitre (19 gals.) of an 8 per cent. solution, for winter use, costs about 6*d*., of a 4 per cent. solution, for summer use, about 2½*d*.-3*d*. The author summarises the use of the lime-sulphur mixture as follows:—It can only be used against a few specified pests such as scale-insects, gall-mites and fungus diseases. It can be used instead of the lime-copper mixture, and is to be preferred on the grounds of its cheapness and its harmful effect on the green parts of the plant. As it is not, however, a universal remedy lime-copper mixture and other recognised remedies should not be put aside.

MIESTINGER (K.). **Der Apfelwickler** (*Cydia (Carpocapsa) pomonella*, L.).—*Sonderabdruck aus "Der Obstzüchter,"* no. 2, 1913, 5 pp., 3 figs.

A description of *Cydia pomonella*, with a brief account of its life-history and of the usual methods of control, viz., the destruction of the maggot in the fallen fruit, keeping the stored fruit in closed rooms to avoid the moth, and methods of spraying.

JONES (C. R.) & MACKIE (D. B.). **The Locust Pest.**—*The Philippine Agric. Rec., Bureau of Agriculture Circular No. 23, Manila*, 31st July 1913, pp. 417-424, 2 pls.

This article is practically a reprint of a paper by the same authors published in Vol. vi., no. 1, January 1913, of the same journal, of which an abstract appeared in Series "A," p. 65 of this Review.

WAHL (B.). **Die Bekämpfung der Blattläuse (Aphidae).** [Remedies against Aphids.] — *Sonderabdruck aus Monatshefte fur Landwirtschaft*, 1913, *Mitt. der k. k. Pflanzenschutzstation, Wien*, 4 pp.

This is a short paper dealing with the common green fly (*Aphis*) and the methods useful in combating it, which the author divides into summer and winter remedies.

*Summer Remedies.*—

1. Tobacco extract and soft soap solution: a good solution is made up of 3 lb. tobacco extract and 3 lb. soft soap, to 20 gals. water. The soft soap is dissolved in a quart of hot water, and the rest of the water with the extract added.

2. Tobacco extract and lysol mixture: 2-3 lb. tobacco extract and 1-½ pint lysol* or demilysol in 20 gals. water. Mix the water with the extract and add the lysol.

3. Petroleum and soft soap emulsion: 3 lb. soft soap is dissolved in 5 or 6 pints of hot water, and mixed and shaken with ½ pint of petroleum. This is put into a vessel into which a funnel is fitted, so that the mixture can be well shaken and water added at intervals; 7-8 quarts of water are added and the mixture shaken until a milky emulsion is formed (the petroleum should no longer form an oily layer on the surface).

4. Quassia and soft soap mixture: 3 lb. quassia chips is boiled in 2 gals. of water and left standing for 24 hours; the liquid is then poured off; this is mixed with an equal volume of neutral soap solution, made by dissolving 5 lb. of soap in 2 gals. of water. This remedy is useful when the others mentioned are unsuitable on account of their smell.

The addition of soap and lysol or demilysol in these remedies counteracts any harm which the spraying liquid might do, and they increase the power of the liquid to kill the pest. Plants which are grown for seed or fruit and must be pollinated should not be sprayed during their flowering period.

Methods involving fuming may be used in closed rooms. For fumigation in hot houses, etc., tobacco powder is mixed with wood-charcoal in a vessel and allowed to burn for 12 hours; or tobacco extract is steamed on hot iron plates, it being first of all diluted with twice its volume of water. Certain delicate plants are not able to withstand the tobacco fumes.

*Winter remedies.*—As the plants are not growing, much stronger remedies may be used in winter than in summer.

1. Schilling's petroleum-soft soap mixture: 15 dkg. of soap are dissolved in 1 litre hot water, and 180 dkg. petroleum added (but *not* over the fire!). The emulsion is shaken and diluted with 4-5 times its volume of water.

2. Soluble fruit tree carbolineum (obstbaumkarbolineum): the commercial preparation is diluted with 5-20 times its volume of water and is applied early in spring.

3. Lime-sulphur mixture. This is recommended in America, but was used in the Pflanzenschutzstation without results.

**Vayssière (P.). Le Pou de San José—*Aspidiotus perniciosus*, Comst.** [The San José Scale.]—*La Revue de Phytopathologie Appliquée, Paris*, i, nos. 6 and 7, 20th Aug. and 5th Sept. 1913, pp. 81-85, 3 figs.

All fruit trees are attacked by this pest, except the chestnut, fig, cherry and vine. The most susceptible to attack are the pear, peach, plum and apple. On the peach the older parts are attacked before the young shoots; an infested tree can be killed in 2-3 years. On the apple and the pear, the small terminal shoots are the most infested, as also is the mature fruit. Some varieties exhibit a certain degree of immunity to the parasite, such as, according to Marlatt, American pears of the varieties "Leconte" and "Kieffer." Forest or ornamental trees most liable to attack by the San José scale are those belonging to the following genera:—*Acacia, Cotoneaster, Crataegus, Fagus, Populus, Ribes, Rosa, Salix, Tilia, Ulmus*, etc. The following are not attacked: *Ailanthus, Cedrus, Corylus, Gingko, Hedera, Ilex, Magnolia, Platanus, Quercus*, etc., also the conifers, except *Picea alba* and *Thuya*, which are occasionally attacked. Herbaceous plants are apparently immune; the strawberry, however, and the species *Digitaria sanguinalis* and *Asclepias cornuti* are attacked. Nursery plants, when invaded, seldom reach maturity and may remain merely vegetative for several years.

**Die Bekämpfung des Heu -und Sauerwurms mit Conchycid (Conchylin).** [Combating the Vine Moth with Conchycid.]—*Bericht über den 27ten deutschen Weinbaukongress in Mainz, vom 6-11 Sept. 1913. Luxemburger Weinzeitung, Grevenmacher*, i, no. 28, 15th Oct. 1913, pp. 486-488.

Experimenters have treated different vine-stocks at different times with Conchycid (formerly known as Conchylin), as a remedy against the second generation of *Clysia ambiguella*. The stocks were dealt with at the end of July and beginning of August. The quantity of liquid used varied from 8-15 gallons for 1,000 stocks. The time taken in applying the liquid occupied from 5-24 hours. In one case, 1,000 stocks treated with 15 gallons of liquid during 24 hours resulted in 35-40 per cent. of worms being killed. This was the result of a single treatment. Upon a second spraying, remarkable results were obtained. While a neighbouring vineyard hardly bore any grapes, the treated plots bore the full quantity, which were green and healthy. Vines treated with Conchycid were healthier than those sprayed with nicotin. As yet there is no sign of any damage done by the Conchycid itself. It is said that it gives the juice a peculiar flavour, but even if this be true, it disappears entirely during fermentation. The price of Conchycid is about 3 marks (3*s.*) for 100 litres ($22\frac{1}{2}$ gals.). A $1\frac{1}{2}$ per cent. nicotin mixture costs at least 3·45 marks (3*s.* $5\frac{1}{2}$*d.*) for 100 litres. Conchycid can be added to Bordeaux mixture, just as nicotin may, but its action as a simple solution in water is equally effective. Sugar and casein can be added, if necessary. Soap is best left out of the mixture. Conchycid is not poisonous. Any spraying apparatus can be used and the metal is not attacked.

**Insect Notes.—Extracts from Reports of the Entomological Division.** —*Agric. Jl. Union of S. Africa, Pretoria*, vi, no. 1, July 1913, pp. 87-92.

This article consists of extracts of general interest from the reports for April and May of the Division of Entomology. In April, locusts were reported from various parts. A single specimen of *Cyrtacanthacris septemfasciata* was found in the Lydenburg District. In spite of every precaution, a swarm of locusts was reported from the district between Baroda and Tafelberg. Probably the same swarm was the subject of another report from the same district, when the extent of the swarm was estimated at 20 square miles. Fruit moths (*Achaea (Ophiusa) lienardi* and probably other species) were reported from Lourenço Marques and from East London. The Bagrada Bug (*Bagrada hilaris*), infesting cruciferous crops, was reported from Pretoria and to a less extent from Lydenburg, Rustenburg, Warmbaths and other outlying parts of the Transvaal. Strong contact insecticides such as soap (10 lbs. to 20 gals. water) kill the pest, but are injurious to the plant. Lucerne and lawn pests caused considerable damage. Formulae are given for making mixtures for combating them; 20 lbs. of bran are moistened with a solution of 4 lbs. of sugar in water. In one case 1 lb. of Paris green is added; in a second 1 lb. white arsenic; and in a third 1 lb. arsenate of lead paste. Another formula is:—bran 20 lbs., sugar 8 oz., and Paris green 4 oz.

Five occurrences of Codling Moth (*Cydia (Carpocapsa) pomonella*, L.) were reported. From the May report, it is stated that two nurseries were quarantined. A list of the nurseries in quarantine to date is given.

The locusts reported in April laid eggs and infested roughly a triangle with its corners at Middelburg, Schoombie and Fish River. The swarms were not dense, and only slight damage was done. The species was not identified with certainty, but if it is not actually *Locusta pardalina* (= *Pachytylus sulcicollis* = *P. capensis*) it is a close relative. A few specimens of a parasite of the Fruit Fly (*Ceratitis capitata*) were given to the Division by Dr. Silvestri, who visited S. Africa in quest of them. These insects are being successfully reared and it is hoped to establish them out of doors on the coast of Natal, if not in cooler parts, after the winter. As they come from tropical regions, it is questionable whether they will thrive in the Union, but in view of their power of destroying the fruit fly, the effort will be made to establish them.

**Insect Notes from the Seychelles.**—*Ann. Rept. on Agric. and Crown Lands for the year* 1912, *Victoria, Seychelles*, 1913, pp. 15-17.

The author says that parasitic fungi to which he called attention in his annual report for 1911 [see this Review, Series A., p. 75] which had made their appearance on scale-insects in

various localities mostly above 1,800 feet elevation have continued their good work and have greatly relieved the Para rubber trees and coffee bushes.

*Lecanium nigrum* which attacks Para rubber is parasitised even in the low country by a species of *Hypocrella*. The other *Lecanium* found in the Colony are as follows:—*L. oleae* on *Ficus nautarum*; *L. hesperidum* on cassias; *L. tessellatum* on coffee, coconut and cinnamon; *L. longulum* on anonas; *L. frontale* on casuarina; and *L. viride* on coffee, citrus, ixora, etc.

The fungus known as *Cephalosporium lecanii* has spread to all parts of the Archipelago and keeps the green scale in check to such an extent that the planters are surprised to see their coffee bushes restored to health in an apparently mysterious manner. The author thinks that it will not be possible to spread this fungus in the low country except in very wet years, such as was 1912.

The small black ant, *Technomyrmex albipes*, which is the commensal of the scale-insects and materially assists them in their work of destruction, is still very abundant in all localities and has itself become a plague on account of its depredations. Attempts to destroy these ants have been made in two ways:—by tying paper bands round the trees smeared with a patented mixture called "adhesite"; or, as recommended by Professor Woodward, California, by placing a diluted solution of arsenite of soda in sugar syrup in receptacles, in such a manner that the ants would get to it and carry it in a continuous supply to their nests, where it might be fed to the queen and larvae. There are practical difficulties in the way of arranging for a regular supply of this poisoned syrup in a proper manner in consequence of the necessity of exposing the syrup to the weather, but the author says that he has seen bananas, which are ideal plants for attracting ants, rapidly cleared of them when the poisoned syrup had been distributed around them.

CHANDLER (W. H.). **Instructions for Spraying.**—*Missouri State Board of Agriculture.* Special Bulletin no. 57, N.D. (1913), 53 pp., 22 figs., 3 pls.

Of the stomach poison sprays, arsenic compounds are the chief ingredients; of the contact poisons, the most important are lime-sulphur, kerosene emulsion and the miscible oils. The cost of four sprayings is roughly estimated for trees varying from 12-18 years old in good soil at 4½*d.* to 6½*d.* for materials and slightly more for labour, but it is impossible to give any accurate estimate unless the size of the trees and other conditions be known.

The net gain by spraying apples, roughly estimated, is 5*s.* 5*d.* per tree. This is taking the income from a sprayed tree as 9*s.* 8½*d.* Here again it is only possible to give an average figure. The initial expenses, viz., the cost of equipment, must be taken into account when dealing with the profits of spraying. If the crop is steady year after year, the standing expenses of the equipment are much less in proportion to the profit than when the crop is irregular and subject to destruction by frost, etc.

The biting insects of the apple may be controlled by summer spraying. These are the Codling Moth (*Cydia (Carpocapsa) pomonella*, L.) and the Curculio (*Conotrachelus nenuphar*, Hbst.). The best spray is made up of lead arsenate; the paste should be used at a strength of about $2\frac{1}{2}$ lb. to 50 gals. of water. The spray must penetrate to the base of the calyx, and should be repeated two or three times. The first spray is given as soon as the bloom falls and the second in about 2 or 3 weeks. The sucking insects of the apple are the Woolly Aphis (*Schizoneura lanigera*, Hausm.), the San José Scale (*Aspidiotus perniciosus*, Comst.), and the Oyster-shell Scale (*Mytilaspis pomorum*). For the Woolly Aphis a spray of 10 to 15 per cent. kerosene emulsion, to be sprayed about the roots, is recommended. The San José Scale may be treated by spraying with lime-sulphur mixture of about 1·03 sp. gravity, or by use of the miscible oils. The Oyster-shell Scale is best controlled by spraying with a 7 per cent. kerosene emulsion shortly after the bloom falls.

The insects of the pear that can be controlled by spraying are the same as those of the apple.

Spraying peaches is a more delicate process than spraying apples or pears, as the foliage is more susceptible to injury from most sprays. Bordeaux mixture should not be used, except when the foliage is off; Paris green should never be used. Lime-sulphur properly made is not injurious, and arsenate of lead can be employed, if not used more than twice during the first season and not after the foliage is old, and it should always be mixed with lime. The Curculio (*C. nenuphar*) should be combated with arsenate of lead; the first spray should be given just after the calyx has fallen; it should not be stronger than 2 lb. of the paste to 50 gals. water. A second spraying should be applied about three weeks after the first. The insects of the peach which are destroyed by other means are borers (*Sanninoidea exitiosa*, Say) and the Fruit-tree Bark-beetle (*Scolytus rugulosus*, Ratz). The former is a serious pest; it is combated by digging out the larvae. The *Scolytus* does not attack healthy trees; all weak, infested trees and limbs should be cut down.

The chief insect pest of plums is the Curculio (*C. nenuphar*). It should be sprayed with arsenate of lead 2 lb., lime 3 lb., water 50 gals., about the time the calyx drops, and again in 2-3 weeks. This insect is also troublesome with the cherry and difficult to control. Spraying should be done as soon as the calyx is off, but no later spraying can be given, since the fruit ripens too quickly and is liable to be discoloured by the spray.

The insects of the grape are not serious in Missouri. Curculios (*C. nenuphar*) make feeding punctures in the autumn. This can be best controlled by covering the bunches with a paper bag, leaving a hole in the bottom for water to run out.

Strawberries are attacked by the Strawberry Leaf-roller (*Phoxopteris comptana*, Frohl.), the Strawberry False-worm (*Harpiphorus maculatus*), the May Beetle (*Lachnosterna fusca*, Frohl.), and the Crown Borer (*Tyloderma fragariae*, Riley). The surest remedy for the Leaf-Roller is to mow down the plants and burn the bed off after the strawberries have been picked. Spraying when the strawberries are about half-grown will kill the insect,

but it is difficult to spray strawberries, as they so soon ripen. The False-worm can be killed by spraying the leaves upon which it feeds, but the same objection applies. Powdered white hellebore (1 lb. to 3 gals. of water) may be used; it does not harm the fruit. The May Beetle feeds upon the roots of the plant; the remedy is to grow some crop other than grass or strawberries on the land until they are starved out. For the Crown Borer, rotation is also the remedy.

On gooseberries and currants the chief pests are the Imported Currant Sawfly (*Nematus ventricosus*, Comst.), and the Currant Spanworm (*Diastictis ribearia*, Comst.), which can be treated by spraying with arsenate of lead, and the San José Scale, treated the same way as for apples.

On the potato, the Colorado Potato Beetle (*Leptinotarsa decemlineata*) and the Flea Beetle (*Epitrix cucumeris*) are the chief insect pests. The former may be treated with arsenate of lead, 2½ lb. to 50 gals. water; the latter are not easily combated by spraying; Bordeaux mixture does good, though it does not kill the insect.

On the tomato, the common Tomato-worm (*Phlegethontius celeus*) the Cutworms and the Flea Beetle (*E. cucumeris*) are the most troublesome pests.

The Tomato-worm can be controlled by hand-picking, or by spraying with lead arsenate. Cutworms can be controlled to some extent by the use of poisoned baits.

The Weevil (*Bruchus obtectus*) is the most common pest on beans. It is combated by treating the seed with carbon bisulphide—1 oz. to 100 lb. of seed.

Cutworms, Cabbage-worms (*Pieris rapae*) and the Harlequin Cabbage Bug (*Murgantia histrionica*) are pests of the cabbage, cauliflower, kale, etc. Cabbage-worms are treated with lead arsenate spray, when the cabbage is about two-thirds grown. The Harlequin Bug cannot be controlled by a spray which will not also injure the plant.

MORSTATT (H.). **Ostafrikanische Termiten II. Die Natal-termite und andere Arten auf Kautschukbäumen.** [East African Termites. The Natal Termite and other species attacking Rubber Trees.]—*Der Pflanzer, Dar-es-salaam*, ix, no. 9, Sept. 1913, pp. 443-463, 3 pls.

Two species of termites attacking rubber trees are described in detail, viz., the Natal termite (*Termes natalensis*, Hav.), and the black-brown termite (*Acanthotermes militaris*). The former has already been dealt with by Fuller (Agric. Journ. Union of S. Africa, iv., 1912, nos. 3 & 4). The present paper describes the various individuals of the termite colony and their life-history. The description of the nest differs very markedly from that of both Sjöstedt and Fuller, who describe it as a mound; the present author states that it lies below the surface of the earth. It begins at a depth of about 6 inches, and no trace of it can be seen from above. In the case of the rubber tree, the termite eats

into the cambium and the sapwood of the root, thence penetrating into the stem. In ordinary circumstances the inroads are confined to the wood, but if the weather has been unusually dry the termites turn to the sap for moisture.

Other species attacking rubber cannot be regarded as serious pests, and it is only in a few cases that they have been known to attack healthy trees. The following have been identified: *Termes badius*, *T. redenianus*, *T. monodon*, *T. latericius*, and *Eutermes rectangularis*.

The difficulty in combating termites lies in the fact that, to do any real good, the nest must be destroyed, and owing to the subterranean habits of some of the species, the nest is often very difficult to find. Methods of combating attacks fall into two categories:—(1) Keeping the termites away from the tree, and (2) destroying the termites after they have once made inroads into the tree. Of the methods used for preventing the termites from reaching the tree, none can be described as satisfactory, except that of ridding the plot of ground of termites before planting the trees. Many chemicals were tried, such as carbon tetrachloride, carbon bisulphide, potassium cyanide, sodium arsenate, formalin, lysol and calomel. Their effect upon the nests were found to be nil or very slight, as is shown by an accompanying table. The method recommended as the best is that involving the use of the machine known as the Ant-destroyer, which is constructed to pump poisonous gases into the nest, filling every part of it. By its use the entire nest can be destroyed. As regards attacking the termites which have already eaten into the tree, experience up to the present has not taught very much; it is not known whether scraping off the bark on that part of the tree attacked, and, the removal of the earth in that region, give good results. In some cases a mixture of calomel and sugar has been tried with good effect.

DEWITZ (J.). **Physiologische Untersuchungen auf dem Gebiet der Schädlingsforschung. II. Uber Wachstumshemmungen bei Inseektenlarven.** [Physiological Researches in connection with the study of pests. On the arrest of growth in insect larvae.]—*Sonderabdruck aus der Naturwiss. Zeits. fur Forst- und Landwirtschaft, Stuttgart*, xi, pt. 9, 1913, pp. 431-440.

This paper deals at some length with experiments made upon developing larvae of certain injurious insects. The author is of the opinion that in the cases which he examined, decreased oxidation, following upon the separating out, or accumulation of toxins in the animal, or in consequence of self-poisoning, can be brought about. Larvae were kept in a warm temperature—which is said to act on the blood, destroying the oxydases contained in it—and the caterpillars obtained were only half the size of those grown under normal conditions. Larvae fed on the serum of sheep or snails also had their growth either arrested or decreased. The author holds that the serum prevented the formation of oxydizing enzymes (oxydases), and that the growth of the larva and the formation of enzymes go hand in hand. A good bibliography of the subject is given.

GRAF (A.). **Die Bedeutung unserer Vogelwelt für die Landwirtschaft.** [The importance of birds in agriculture.]—*Schweizerische Zeitschrift fur Obst- und Weinbau, Frauenfeld*, xxii, no. 18, 26th Sept. 1913, pp. 282-285.

In a lecture delivered before the Cantonal Agricultural Society of Zurich the author states that some interesting experiments and observations have been made, leading to the conclusion that no small importance should be attached to the rôle played by birds in the destruction of insect pests. A blue titmouse, for example, will consume more than its own body weight in food each day. It may be estimated that a pair of these birds, with their young, require no less than 75 kilograms per year of living insects, their larvae, pupae or eggs. Three blue tits and three cole-tits consumed 8,000 to 9,000 insect eggs daily, and three marsh-tits, one cole-tit, a long-tailed-tit and a golden-crested wren consumed 600 caterpillars in 100 minutes. From these and similar results it follows that birds are a valuable asset in agriculture as destroyers of insect pests, and every effort should be made to protect and encourage them.

VASSILIEV (E. M.). **ЧЕРНЫЙ СВЕКЛОВИЧНЫЙ ДОЛГОНОСИКЪ ВЪ ПОДОЛЬСКОЙ ГУБ. НА ВЫСАДКАХЪ** [*Psalidium maxillosum*, F., in the Government of Podolia on transplanted seedlings].—**ТРУДЫ ОПЫТНОЙ ЭНТОМОЛОГИЧЕСКОЙ СТАНЦІИ** Всероссійскаго Общества Сахарозаводчиковъ за 1912 г. [Studies from the Experimental Entomological Station of the All-Russian Society of Sugar-refiners for the year 1912]. *Kiev*, 1913, pp. 3-6.

On the 13th of April of last year two species of weevils (CURCULIONIDAE), found in the beet plantations of the Grushki Refinery in the Government of Podolia, were sent to the Station. One of these proved to be *Psalidium maxillosum*, F. In Russia these insects are found in the Governments of Voronezh, Poltava, Podolia, Cherson, Ljublin, Taurida, and also in the Crimea, Caucasia and Turkestan. Little is known of the biology of this pest of the beet and vine, and its eggs, larvae and pupae are still unknown; it is assumed that it winters in the imago stage. As to its food, it was observed on plants of the orders Compositae (*Artemisia cirsium*), Cruciferae (*Lepidium draba*, L.), Chenopodiaceae (sugar beet), and also on the vine. As remedies, spraying with barium chloride, Schweinfurt green, or djipsin can be recommended; as the beetles cannot fly, trap ditches, with bait-wells at intervals along their bottoms, will prove useful for catching them. The author points out that the beetle feigns death when touched, which fact, coupled with its dark colour, leads him to assume that it feeds also in the day-time.

The other beetles sent to the Station were identified as *Tanymecus palliatus*, F. They injure the leaves of beets, as well as of some plants of the orders Papilionaceae, Cruciferae and Urticaceae.

VASSILIEV (E. M.). ВАЖНѢЙШІЯ МѢРЫ БОРЬБЫ СЪ ЖУКАМИ И ЛИЧИНКАМИ КРАСНОГРУДАГО ЛИСТОѢДА, ПОВРЕЖДАЮЩИМИ ЯРОВЫЕ ЗЛАКИ [The chief remedies against the larvae and beetles of *Lema melanopus*, L., a pest of summer-sown grain].—ТРУДЫ ОПЫТНОЙ ЭНТОМОЛОГИЧЕСКОЙ СТАНЦІИ Всероссійскаго Общества Сахарозаводчиковъ за 1912 г. [Studies from the Experimental Entomological Station of the All-Russian Society of Sugar-refiners for the year 1912] *Kiev*, 1913, pp. 1 2.

During 1910 and 1911 the beetles and larvae of *Lema melanopus*, L., injured the leaves of oats, barley and summer-sown wheat in the neighbourhood of the Rubejan Sugar-refinery in the Government of Charkov. The insects ate out longitudinal strips of the parenchyma of the leaves, between the veins, causing the leaves to turn a white colour. Low-lying and wet spots are attacked first, and owing to the loss of chlorophyll the growth of the plants is delayed and the harvest of grain decreased by 25-50 per cent. and over. Oviposition takes place in April on the leaves of summer crops and meadow-grasses, more seldom on winter crops and maize. Greater damage is done by the larvae, which at the beginning of June or towards the middle of the month pass into the earth to pupate at a depth of 2-3 inches. In about a fortnight they assume the adult form, but do not issue from their cocoons until the following spring. Thus only one generation appears yearly, but usually all the stages are found simultaneously owing to the prolonged emergence period of the adults in spring.

As remedies are suggested, in the lower and wet places, spraying with 5 per cent. barium chloride, with 5 per cent. of molasses added; or with 0·17 to 0·2 per cent. of Schweinfurt green, with 0·6 per cent. of freshly slaked lime; or with a 1-2 per cent. solution of tobacco extract. Should the larvae appear in great numbers where no remedies have been previously applied, there remains nothing but to cut the damaged parts of the crop, dry the swath outside the field and use it as food for cattle. After the harvest is gathered from the infested fields, it is necessary to replough the stubble, so as to destroy the insects in their various stages in the earth. Prof. Lindeman suggests as a remedy the cultivation of winter barley and winter wheat, which are not attacked by the insects.

FABER (P.). **Vogelschutz im Weinbaugebiet.** [Protection of Birds in relation to Vineyards.] — *Luxemburger Weinzeitung*, *Grevenmacher*, i, no. 27, Oct. 1913, p. 468.

The writer says that in combating pests, natural conditions may be made use of, and refers particularly to the advantages gained by protecting and encouraging insect-eating birds, such as the swallow, redstart, wagtail and flycatcher in summer, and the tomtit and nuthatch in winter. In Mainz the protection of birds

has been developed on a large scale by the State. Artificial nesting-boxes are hung up, and these are almost invariably made use of by the birds in the breeding season.

BODKIN (G. E.). **Control of the Rice Worm.**—*Jl. Bd. Agric., British Guiana, Georgetown*, vii, no. 1, July 1913, pp. 53-54.

The author desires to call the attention of all rice cultivators to the following methods for stopping the attacks of caterpillars on young rice, and says that they will prove effective if properly carried out. The crops should be carefully inspected for caterpillars as soon as green shoots appear, and if any are found, specially prepared and finely powdered arsenate of lead should be dusted lightly over the plants, and this will quickly poison the caterpillars. The application can be made by beating the powder through light cloth sacks or by means of a dusting machine. As the caterpillars do most damage when the rice plants are only a few weeks old, flooding is a very effective method of destroying them. This can be arranged for by making the dams around the nursery beds sufficiently high that the plants can be completely covered with water. The caterpillars float off on the surface and may be easily collected and destroyed. When flooding is not possible, it is not difficult to have the caterpillars collected by children and dropped into a tin containing water and a little kerosene. Small perches for birds that eat the caterpillars should be placed in the nursery beds, actual cases have been observed where these have proved exceedingly useful. The ground around rice cultivation should be kept as free from grass and weeds as possible, as this is a great help in keeping the caterpillars away from rice. And finally, co-operation is absolutely necessary for successfully combating the pest in a number of rice-fields lying close together.

VUILLET (A.). **La perceuse ascendante des tiges de rosier.** [The upward boring insect of the rose tree.]—*La Revue de Phytopathologie Appliquée, Paris*, i, no. 5, 5th Aug. 1913, p. 74.

Two species of TENTHREDINIDAE bore into the stems of rose trees, *Ardis bipunctata*, Klug, from above downward, and *Monophadnus elongatulus*, Klug, in the reverse direction. In the case of the latter species, the female deposits each egg in a depression made with her proboscis at the base of a petiole of a flower. The young larva leaves the base of the flower and pierces a hole in a young stem, which it enters. The passage it hollows out is always ascending, and is about 5 inches in length. The remedy is to introduce a fine iron wire into the hole; this kills the larva. The disadvantage of this remedy is that it necessitates much manual labour. In any case, at the time of gathering the flowering branches, it must be seen to that if the stem is cut through a passage, the part of the stem left below it shall also be cut away, so that moisture, etc., cannot enter the burrow and cause the decay of the branch.

BARSACQ (J.). **Le Bombyx dissemblable ou spongieuse** (*Lymantria (Ocneria) dispar*, L.). [The Gipsy Moth.]—*La Revue de Phytopathologie Appliquée, Paris*, i, no. 5, 5th Aug. 1913, pp. 70-73, 2 figs.

In this article the ravages of the gipsy moth in the Crimea are described. The remedy recommended is lead arsenate. *Lymantria dispar* is attacked at various stages of its development by natural enemies. Birds, with the exception of the cuckoo and the starling, do not devour the larvae, but there are many useful insect parasites, notably *Hadronotus (Telenomus) howardi*, Mokr., which in the Crimea destroys three-quarters of the eggs. The young caterpillars are frequently infested by *Apanteles fulvipes*, Hal., *A. solitarius*, Rtzb., *A. glomeratus*, L., *Pristomerus vulnerator*, Pz., *Echinomyia fera*, L., *Tachina larvarum*, L., and *T. rustica*, Mg., etc. The adult larvae and the pupae are attacked by *Sarcophaga affinis*, Fall., *S. albiceps*, Mg., *Parexorista lucorum*, L., *Roeselia antiqua*, Mg., *Scotia saturniae*, R. D., *Pimpla instigator*, F., *Theronia flavicans*, F., and others of minor importance.

VUILLET (A.). **La lutte contre la Cécidomyie des poires.** [Combating Cecidomyia in Pears.]—*La Revue de Phytopathologie appliquée, Paris*, i, no. 5, 5th Aug. 1913, p. 74.

Cecidomyia (*Diplosis pirivora*, Riley) is one of the most harmful pests of pear trees. In certain districts near Paris, the larvae of this minute fly enter the young fruit and damage half the crop. In the district of Châtenay, where a big revenue is drawn from the cultivation of pears, the municipality have taken up the question of the destruction of *D. pirivora*. In spring, one franc per kilogram is offered for pears attacked by the parasite, which have to be brought to the local government offices in the town; pears which have been picked up from the ground and which the insect has left are refused; 1000-1500 kilograms of pears are brought each year. A still larger quantity is destroyed by cultivators, who do not trouble to claim the money. This method is found to give excellent results. Insecticides, used to prevent the laying of eggs are, according to the experiments of Dr. Marchal, not to be recommended; the same applies to setting up obstacles to prevent the development of the adult in spring. On the other hand, the same author obtained good results in attacking the hibernating larvae by spraying with sulphocarbonate of potassium, very dilute, about 30 kilograms (66 lb.) to the are (120 sq. yds.). It would be interesting to know if this method has been tried anywhere on a large scale, as the experiment in question was made only on a small area.

JONES (C. R.). **The Tobacco Caterpillar** (*Prodenia litura*, **Fabr.**)—*Philippine Agric. Rev., Manila*, vi, no. 9, Sept. 1913, pp. 425-432, 2 figs., 1 pl.

Tobacco is almost the principal staple crop of the Philippines, the chief tobacco district being in Northern Luzon, in the

Provinces of Cagayan and Isabela. The greatest pest in these areas is *Prodenia litura*, F., the larva of which attacks growing tobacco both young and old; but the principal damage is done to the young leaves, as even a small hole made in the bud or growing leaf assumes considerable proportions as the leaf develops. This cosmopolitan pest is present in districts where tobacco is not cultivated, and often attacks other garden and field produce. The insect has frequently been reported from the Visayan Islands as damaging corn, and from the Province of La Union as damaging tobacco. It also occurs throughout the Cagayan Valley, especially in the tobacco fields from Lal-loc to San Luis. It is known throughout that district as the "camarin worm" and is believed by the natives to develop in the camarins or sheds, in a single night. The larvae can be found in their various stages at almost any time wherever a castor-oil plant occurs, as they are particularly fond of its succulent leaves. They are unfortunately general feeders, and the author gives the following list: tomato, tobacco, calaboa (*Monochoria hastata*), maize, cabbage, rice, sweet potato, castor (*Ricinus communis*) and jimsonweed (*Datura* sp.).

Lefroy gives the following as its food-plants in India:- lucerne (*Medicago sativa*), abundant in irrigated lands; jute (*Corchorus capsularis* and *C. olitorius*), feeds upon the succulent apical shoots; indigo, not especially serious; potato, cutting off young plants; marua (*Eleusine coracana*), scarce; urid (*Phaseolus radiatus*), occasionally; *Coleus*, occasionally in gardens; mulberry (*Morus alba*), pakur (*Ficus infectoria*), ground-nut (*Arachis hypogaea*), tur (*Cajanus indicus*), sugar-cane (*Saccharum officinarum*), agathy (*Sesbania aegyptiaca*) and dhaincha (*Sesbania aculeata*).

The eggs are laid on the leaf in clusters of from 35 to 500 each. The mass usually contains 3 layers, and the whole is covered with short buff-coloured hairs from the anal tuft of the moth, and in the author's opinion this hairy covering undoubtedly acts as a protection against parasites. The time of hatching of the eggs in each mass is fairly uniform. The larvae feed on the epidermis of the leaf, working from the underside and keeping close together in masses for 3 to 5 days, completely skeletonizing it. The first moult occurs from 2 to 4 days after hatching, the second 3 days after the first; altogether there are 5 moults. The average duration of the larval stage was found to be 17 days, and that of the pupal stage about 10 days; the total life-cycle about 35½ days. Oviposition takes place early in the evening and at night, and the moths live in the laboratory from 4 to 8 days when fed on sweetened water, but the author thinks that life is undoubtedly longer under natural conditions. Parasites and predaceous enemies play an important part in the natural control of this pest. In spite of the hairy covering of the eggs, two small hymenopterous parasites have been bred from them in large numbers. A large Tachinid fly has also been bred from the larvae and a large black "mud-dauber" wasp was observed several times carrying off the larvae. Birds also consumed large numbers, but to what precise extent has not yet been determined.

Spraying with Paris green or arsenate of lead may be employed, the latter being preferable as it does not damage the plant. Hand-picking is easily carried out, as the egg-masses are not difficult to find, and the author advises that crops should be examined at intervals, and as soon as the pest is discovered active measures should be taken. He suggests that lantern traps standing in a basin of water and kerosene placed about the tobacco gardens would be useful.

**Sopotzko (A.).** Отчетъ о дѣятельности Тульской Энтомологической станціи за 1912 годъ [Report of the Entomological Station of the Government of Tula for the year 1912]. *Tula*, 1913, 39 pp., 1 fig.

The Clover-seed Apion oviposits as a rule inside the flower, previously piercing a hole through the calyx and corolla with its proboscis. The eggs look very like the anthers of clover, for which they may easily be mistaken. Some observations conducted during 1912 have proved that the females may also deposit their eggs on unopened leaf- or flower-buds. In the summer, when the clover is mown for hay, the rapidly growing aftermath contains plenty of young buds on which the females hasten to oviposit; as the blossoms appear, the number of eggs deposited on the former decreases. The larvae appear to be able to develop in such embryonic buds, increasing in size with their growth. A table is given showing that the females oviposit indiscriminately on blossoms with or without seeds in them. Investigations were further conducted with a view to ascertaining whether the mowing of clover influenced the breeding of the insects, and tables of results are given which tend to show that the effect is but slight; so that the mere mowing of the clover without previous disinfection cannot be recommended as a practical remedy against *Apion*.

The following sorts of clover were not infested by the insects:— *Trifolium resupinatum*, *T. repens*, *T. hybridum*, *T. incarnatum*, *T. montanum* and "rose clover." All these, except *T. incarnatum*, have a comparatively long flower-stalk, while the head is soft, with somewhat loosely set flowers which makes it unsuitable for the larvae and pupae of the insect. In *T. incarnatum* the calyx is thickly covered with small hairs, which possibly prevent oviposition. The varieties of clover attacked by the insects are those in which the flowers are closely set.

A table is given containing comparative figures regarding the infection of Baltic, local, Perm, Poltava and German sorts of clover; these figures, however, are not considered to be conclusive. The flowers of clover of the second crop are less injured than those of the first.

The remedies suggested are, the mowing down of the clover in the middle of June, keeping the aftermath for seed, and spray-

ing. When mowing, a bait strip may be left, which attracts the insects, and they can then be destroyed. The insecticide recommended is a solution of Paris green (about 1½ lb.), freshly slaked lime (about 3½-4 lb.) and molasses (about 7-8 lb.) in about 112 gallons of water. The cost of spraying is calculated at about 35 kopeks (9*d.*) per dessiatine (2.7 acres).

The copulation of the beetle was noticed in nature in the middle of May; the duration of the egg-stage was on the average 6·6 days (in 1911, 7·5 days) of the larval stage 17·6 days (in 1911, 16·8 days), of the pupal stage 8·4 days (in 1911, 9 days). The whole cycle occupied on an average 32·6 days (in 1911 33·3 days).

The infection of the insects by parasites was not great in the year under report; only in one case did it amount to 50 per cent. A table is given of the percentages of infected insects in different parts of the Government at various dates, showing a range from 2 per cent. to 50 per cent.

*Euxoa segetum*, Schiff., in 1912 destroyed 13,632 acres of crops in the Government. The first generation appeared on the 9th June, reached its maximum on the 24th June, and disappeared on the 27th July; the flight of the second generation began on 5th September. The rainy weather in August prevented further observations.

*Oscinis frit*, L., damaged spring wheat and barley in some parts. An analysis of different sorts of wheat showed that the damage done increased from 26 per cent. in Swedish, to 30 per cent. in Beloturka, 48·9 per cent. in Mlka, 74·6 per cent. in Saratovka, to 88 per cent. in Shlanshed wheat. Winter crops contained a smaller percentage of damaged heads.

Three generations were observed; the first, having hibernated, appeared from the middle of May, and oviposited on the spring crops; at the end of June the second brood appeared, and laid their eggs on spring and winter wheat, as well as on wild grasses; the last individuals of this brood overlapped the third one, which hatched out from the end of July, the flight stopping on the 26th August.

*Mayetiola (Cecidomyia) destructor*, Say, was found in small numbers, chiefly on winter crops. A table is given showing its distribution in the Government. Two generations could be traced; the first one flew in the early spring; its larvae were found at the end of June, and the cocoons at the beginning of July. The second generation of flies appeared from the 2nd August and continued flying during the whole of August and the first week in September. The insects winter mostly in the larval stage, and only a few as pupae.

It is mentioned that in 1913 the programme of the work of the station will include investigations and observations on beetles of the family ELATERIDAE; on *Hylemyia coarctata*, Fall., which has caused considerable damage during recent years; on *Cydia pomonella* and on *Phlyctaenodes sticticalis*, which appeared in great numbers in some localities during 1912.

**Vassiliev (E.).** **ЭНТОМОЛОГИЧЕСКОЕ ОТДѢЛЕНІЕ ОТЧЕТА О ДѢЯТЕЛЬНОСТИ ОПЫТНОЙ ЭНТОМОЛОГИЧЕСКОЙ СТАНЦІИ**—Отчетъ и Труды Опытной Энтомологической Станціи Всероссійскаго Общества Сахарозаводчиковъ [The Entomological Section of the Report of the Experimental Entomological Station of the All-Russian Society of Sugar-Refiners for 1912]. *Kiev*, 1913, pp. 12-33.

The report consists of two parts, the first of which deals with the pests of sugar-beet. *Bothynoderes punctiventris*, Germ., one of the most important chronic pests, appeared also last year, but did not do much damage, owing to the rainy weather, which is unfavourable to the weevil, and favours the development of the muscardine fungus, which attacks its larvae, so that it may be expected that in 1913 there will be a relatively small appearance of these insects.* Some insects collected on the 24th May oviposited on the 30th May to 4th June. The author discusses spraying apparatus and praises the Vermorel 14-spray horse-traction machine.

*Tanymecus palliatus*, F., is found in European Russia as far north as Vologda and as far south as Taurida, and from Poland to Voronezh. It feeds on plants belonging to the orders Urticaceae, Chenopodiaceae, Papilionaceae and Compositae. Its eggs and larvae are still unknown. On beets the weevils are found singly and damage the seedlings. It is likely that it winters in the imago stage, as it is found in the middle of March, and as late as the beginning of November.

*Sitones lineatus*, L., is often found on beets, and some authors (Mokrzecki, Pospielov) consider it to be a pest of these plants, while Jablonovsky disputes this statement, it being in his opinion a pest of Papilionaceae exclusively. To clear up these conflicting statements experiments were conducted at the Station, which entirely confirmed Jablonovsky's conclusions.

An Elater, *Limonius pilosus*, Lec., was found near Smiela after the 26th June on beets and various other plants, feeding on the nectar and the stigmata. It was not possible to observe the oviposition, nor were the eggs found. It was noticed that these insects were devoured by the Carabid beetle, *Broscus cephalotes*, L., which also devours other beetles of the same genus, and owing to its long life (from April to October) its importance in this respect is very great. The remedies suggested against *Limonius* are:—The planting of potatoes, which free the fields from the pest for the next year; the use of mineral manures; and the dressing of the seeds (of maize) with white arsenic, which it is noted is not touched by the larvae of *Agriotes lineatus*, L.

As another species of the family Meloidae, *Epicauta erythrocephala*, Pall., is known to injure leaves of beets and other plants, the author conducted some investigations at the Station, in company with M. A. Prick, which have shown that *Meloe proscarabaeus* also eats the leaves of beets in the presence, as well as in the absence, of other food. This insect oviposits in the earth, each female laying up to 1,500 eggs; *E. erythrocephala* lays its eggs in the egg-masses of locusts, on which the larvae feed; therefore its destruction cannot be recommended.

*Opatrum sabulosum*, L., is found very often in beet-plantations, but the experiments as to its food conducted at the Station in 1912 did not prove conclusive. The beetles refused wheat, oats, sometimes ate and sometimes refused peas, gnawed small round holes through the leaves of beets, while at other times they ate these leaves only very little and even refused them, perishing without attempting to eat. Similarly, it has been observed that *Blaps lethifera*, Marsh., sometimes eats the leaves of beet, but the real extent of the injury done remains uncertain.

*Cassida nebulosa*, L., were found last year in considerable numbers in various parts of the beet-growing region. In July they were also found on vines growing in sandy soil, but no injury was noticed. The destruction of goose-foot (*Atriplex laciniatum*, L.) is the primary remedy against this insect, especially in wet years when chemical remedies are useless. *Cassida nobilis*, L., was found in small numbers. *Lethrus apterus* Laxm., was sent to the Station from the northern part of Volhynia (50° 40″ N. Lat.), this being its northern limit. Experiments at the Station show that these insects feed on leaves of beet and of *Camelina sativa* (Siberian oilseed), on wheat, oats and sainfoin; the two latter plants have never been known to be attacked by it before. *Anisoplia deserticola*, Fischer, were found in beet plantations on one estate (Kapitonov) in such large quantities that during one day (12th June) about 15,000 specimens were collected; the insects usually kept on the borders of the plantations and injured the summits of the inflorescence, the latter turning black; the insects did not fly much and could be easily collected by hand. They were noticed only on the transplanted plants, not on the sprouts of the sown beet. Owing to hand-picking their numbers diminished considerably to the 18th June. This insect is known in Tyrol, Hungary and South Russia, and lives in sandy meadows, chiefly on spots covered by *Artemisia campestris* and *Cytisus* and surrounded by pine or oak woods. The specimens sent to the Station differed from the typical ones by the presence of narrow black stripes on their elytra, apart from the black suture and the black borders. [Lebedjev considers that the species has been incorrectly determined and that it is really *Blitopertha lineolata*, Fisch.]

*Phlyctaenodes sticticalis*, L., was found last year in Podolia, Kiev and Charkov; the first generation was more numerous, and the beets injured by the caterpillars, yielded less sugar. The author mentions the usual remedies against the insects and points out that the burning of sulphur, with or without dung, to keep away the females from a particular spot and thus prevent oviposition there, cannot be considered adequate. The success of this remedy depends to a large extent on the direction and force of the wind. The eggs are sometimes carried by wind, owing to their being deposited on the seed-capsules of various weeds. The eggs of the second generation were to a small degree infested by a Chalcid parasite. Excluding the activities of parasites and rapacious insects, the rare appearance of the more dangerous second generation is due either to infertility or to the great percentage of caterpillars which die in the two early stages.

*Aphis euonymi-papaveris*, L., appeared, notwithstanding the rains, on the 25th June on the summits of beet stems, but before the blossoming their numbers were not great. They appeared in larger numbers on the male flowers of maize, the colonies consisting of winged and wingless specimens.

Larvae of *Lecanium corni* var. *robiniarum*, Marchal, were found by the author in April 1912 on a field of oats, which field was under beet-cultivation in 1911. Some roots of beet remained in the fields over the winter under some Robinia trees and the larvae hibernated on the petioles and leaves of the beets. There were also found on the same leaves specimens of *Tetranychus telarius*, eggs of which were observed as early as 26th April.

*Pegomyia hyoscyami*, Pz., was comparatively rare; while *Julus unilineatus*, Koch, appeared frequently during the early spring on sprouts of transplanted beets (24th April-5th May). They were found chiefly in fields in which transplanted beets had been grown in the previous year, less frequently on red beet and sugar-beet.

The following pests of other cultivated plants are noted:

*Cicadula sexnotata*, Fall., appeared in May on oats. On the 23rd May some parasitised specimens were found; according to N. V. Kurdjumov the parasites were probably Microhymenoptera. [The description suggests STYLOPIDAE].

*Phyllotreta vittula*, Redt., was observed by the author in masses on maize and *Setaria italica*, eating the leaves; in one spot which was better manured the beetles were notably fewer.

Other insects found on maize were, *Cassida subferruginea*, Schrk., *Lema cyanella*, L., *L. melanopus*, L., and *Anthothrips aculeata*, Fabr. *Entomoscelis adonidis*, Pall., appeared early in the spring on *Camelina sativa*, cabbages, and poppy. On the 26th June some of the beetles were found in the earth at a depth of 6-9 inches in a state of aestivation which lasted up till August. On the 13th September pairing was noticed and on the 16th September heaps of eggs were found on the earth. Small numbers of *E. sacra*, L., were also observed.

*Dorcadion equestre*, Laxm., was found in April in ditches round some beet-plantations. Experiments conducted at the Station showed that the insects do not touch beets, but feed freely on leaves of oats, wheat and sainfoin. *Anisoplia segetum*, Hbst., was found in May on rye.

*Aphis gossypii*, Glov. (*A. cucumeris*, Forbes, *A. forbesi*, Weed) was found by the author in July on melons and cucumbers, this being the first record for the species from the Government of Kiev. The larvae of a weevil, *Stenocarus fuliginosus*, Marsh., were found on poppy roots in Podolia.

*Haltica ampelophaga*, Guér., is found in Russia in Bessarabia, the Crimea and the Caucasus, injuring the leaves, buds and young shoots of vines. A spray of Schweinfurt green is usually applied; some authors recommend also Bordeaux mixture, before the period of oviposition. The author also found on vines another flea-beetle (*Longitarsus* sp.), but in small numbers. *Sitones lineatus* and *Cassida nebulosa*. *Notoxus monoceros*, L., and *N. cornutus*, F., were observed on vines in July. These

Anthicid beetles, besides feeding on the nectar of the flowers of beet, eat also the stigmata of the ovaries. The larvae of *Polyphylla fullo*, L., are very dangerous to vines (as well as to pines) on sandy soils.

*Hyponomeuta malinellus*, Z., *Rhynchites pauxillus*, Germ., and *Anthonomus pomorum*, L., were noticed on apple trees; while on pear trees were found *Psylla pyricola*, Först., *Malacosoma neustria*, L., and *Gastropacha quercifolia*, L.

Cherries were injured by *Eriocampa adumbrata*, Klug, the larvae of which were found by the author in his garden up to the 30th September. *Anthonomus rectirostris*, L., was noticed on the common bird cherry in April. Evidently it winters on morello, feeds in the early spring on the blossoms, and oviposits inside the still soft kernels of cherries and peaches.

*Gossyparia ulmi*, L., was found in colonies on the bark of young elm trees in the Government of Charkov in May, being also known in Cherson and Kiev. The best remedy, according to I. J. Shevirev, is to smear the trunk with turpentine or "fotogen." *Kermes variegatus*, Gmel., were sent from the Suntchank Forest, from oak bark; some females produced parasites. The oak trees are also injured every year by *Haltica quercetorum*, Foucr., the insects hibernating either in the bark or in the earth. In the spring of the next year the females oviposit on the lower part of the leaves, where the larvae remain skeletonising the leaves and pupate in July. Two weeks afterwards the beetles appear and skeletonise the leaves up to the time of the commencement of frosty weather.

*Sciaphobus squalidus*, Gyll., was found in April on buds of some fruit trees, also on *Euonymus*. Copulation took place at the beginning of May, and in the middle of the month heaps of white eggs were found on the ends of leaves turned up by the females. It is assumed that this insect migrates in its first stage, but it is not known whither, nor on what it feeds.

*Pteronus hortensis*, Htg., was found on *Robinia pseudacacia* in the Government of Kiev, this being probably the first record for Russia. The female deposits its egg inside the leaf on the under surface.

DOBROVLJANSKY (V.V.). ВРЕДИТЕЛИ ПОЛЕВОДСТВА И САДОВОДСТВА ПО НАБЛЮДЕНІЯМЪ КІЕВСКОЙ ЭНТОМОЛОГИЧЕСКОЙ СТАНЦІИ ВЪ 1912 ГОДУ [Pests of fields and orchards according to observations made at the Kiev Entomological Station in the year 1912.]—Published by the Entomological Station of Kiev of the South Russian Society for promoting Agriculture and Agricultural Industries. *Kiev*, 1913, pp. 14.

Most of the experiments conducted on the larvae of *Bothynoderes punctiventris*, Germ., did not succeed, as they would not live in captivity. Of the larvae collected underneath beetroots in the fields more than half perished, being infected by the

muscardine fungus. The results of some experiments on spraying the larvae with (1) 1 per cent. Korsun green, and (2) 1½ per cent. Korsun green with 1 per cent. slaked lime, are given in a table: from this it appears that the former insecticide, under natural conditions, destroyed from 7½ per cent. to 22 per cent., and the second from 18 per cent. to 36½ per cent. of the larvae (in three successive days). The first pairing was noticed, in the laboratory, on the 9th May, oviposition proceeding from the 14th May till the 9th July; the larvae appeared about 11-12 days later. *Cassida nebulosa*, L., has done some damage to beets in the Government, although the injury was not serious, owing to the fact that the larvae migrated on to the beets from goosefoot, on which the eggs were laid, only a short time before pupation. The most suitable insecticide proved to be a 6-7 per cent. solution of barium chloride. Two generations were noticed.

*Simaethis pariana*, Cl., was found in large numbers in the Government of Tchernigov, and although not seriously injuring apples, deformed them. All stages could be found at the same time. A large percentage of caterpillars were infected by parasites.

*Cydia (Carpocapsa) pomonella*, L.—The results of some experiments with tanglefoot belts, which are given in a table, show that during 2 months on 10 belts there were found 93 caterpillars of *C. pomonella*. A table is also given showing the effects of three insecticides used: Schweinfurt green, Korsun green and Akridin. Some parasites were imported from Astrachan (by J. F. Schreiner), viz., *Trichogramma semblidis*, Aur., and *T. carpocapsae*, Ashm. The former was found to attack the eggs of various moths, preferring those of *C. pomonella*, *Euproctis chrysorrhoea*, L., and *Barathra (Mamestra) brassicae*, L. After this parasite had multiplied in the laboratory, the insects were released in two orchards and later observations proved that all the eggs of *C. pomonella* found were infected by them. *C. pomonella* is the most widespread pest of orchards in the Government of Vitebsk, where only one generation is observed. In the northern part of the Government of Tchernigov the insect has destroyed about three-fourths of the apple crop.

*Pandemis cerasana*, Hb., was found in an orchard in Kiev: the moths flew from the 15th June, paired on the 17th and began to oviposit on 19th. The caterpillars appeared about 10 days later; they pupate between two uninjured leaves drawn together. *Tmetocera ocellana*, F., was also found in the same orchard; its larvae live at first on the leaf-buds or blossoms; later on they feed on the leaves. The first pupae were found on the 6th June. *Capua reticulana*, Hb., has done considerable damage to fruit-trees, the larvae injuring the leaves and when further developed attacking also the fruits. The first moths appeared on the 6th August. The eggs are laid on leaves of apple and plum, and on currants, in heaps of 95-160 eggs. They were parasitised by *Trichogramma semblidis*, Aur., and *T. carpocapsae*, Ashm., the latter parasite being found more frequently. On the 4th September the percentage of eggs infected was 38·3 rising to 55·5 per cent. on the 23rd. As this insect is

attracted by light it is recommended to put out at night troughs containing molasses and water, with lamps suspended above them.

*Euxoa segetum*, Schiff.—The first generation flew from the 3rd June. In 7 troughs containing molasses, between 10th and 30th June, 37 specimens of *E. segetum*, 27 of *Feltia exclamationis*, L., 16 of *Euxoa conspicua*, Hb., and 3 of *Plusia gamma*, were caught. The second generation flew from the 5th to 31st August and in the same number of troughs were found during this time, 46 specimens of *E. segetum*, 29 of *E. conspicua* and 6 of *F. exclamationis*. In 5 troughs put out on another estate there were found between 24th May and 20th June, 4,395 specimens of *E. segetum* (1,582 males and 2,813 females), also specimens of *Barathra brassicae*, L., and *Scotogramma trifolii*, Rott.

In the Government of Vitebsk, where there is only one generation, in June, the insects have appeared in great numbers, injuring winter-sown crops. They have also injured tobacco plantations in the Government of Tchernigov. One female began ovipositing in an observation cage on the 7th September, laying about 150-300 eggs daily; up to the 22nd September 1,700 eggs had been deposited.

The second brood of *Caliroa albipes*, Klug, appears in the middle of June; the females, fecundated or not, oviposit on the central vein of the leaves of cherry trees; the larvae appear 8 days later, developing in about three weeks, when they fall to the earth and pupate in grass or fallen leaves. In about 9-12 days the imagos appear. The injury done to cherry is sometimes very serious. *Cephus pygmaeus*, L., has done some damage to winter-sown wheat, being seldom found on oats. The larvae were found after the 9th July. The injuries were noticed on fields damaged by *Mayetiola (Cecidomyia) destructor*, Say.

The puparia of the latter fly were found on some estates after the 21st July; of 135 puparia collected on the 21st-25th July 79 were empty, while out of the remainder there issued up to 17th August 3 specimens of *M. destructor* and 20 parasites. The third generation started flying at the beginning of August and continued through the month, some of the pupae hibernating, while a fourth generation appeared at the beginning of September.

Results of trap-crops for *Oscinis frit*, L., are reported. On one estate on a trap-crop of barley, sown on the 21st May, the first young larvae were observed on the 5th June, while on the 15th June the puparia were noticed; the flies issued from the 6th July to 2nd August, when the crop was ploughed in. The percentage of infested sprouts was 45; 21 per cent. of the cocoons were infected by parasites. A second trap-crop of oats on the same estate sown on the 11th July yielded the first larvae on the 23rd July, the first puparia on the 6th August and the first flies on the 12th September. The percentage of infested sprouts was 55, the percentage of cocoons infected by parasites 16. The insects of the third generation were also found on some estates on the sprouts of fallen grain, the percentage of infested sprouts being about 10 on

26th August; while on the 5th September the percentage of infested winter wheat was 20-25. The infestation of the trap-crops was the greater the nearer these were to the main crops; sowings made on fallow land were less attacked. The reploughing of these spots required also the heavy rolling of the soil, in order to be successful, as otherwise the flies freely emerged from underneath the earth. From the 24th August to the 10th November the insects were mostly in the larval stage, in which stage the majority of them wintered. On oats, on one estate were also found together with *O. frit* specimens of *Oscinis pusilla*, Meig.; its larvae were found throughout July, its puparia, in the beginning of August, the flies emerging at the end of that month. The percentage of infected grains was 1·2 on the average, rising to 10 in some places.

**БЮЛЛЕТЕНИ О ВРЕДИТЕЛЯХЪ СЕЛЬСКАГО ХОЗЯЙСТВА И МѢРАХЪ БОРЬБЫ СЪ НИМИ** [Bulletins on the pests of agriculture and methods of fighting them. Issued by the Entomological and Phytopathological Bureau of the Zemstvo of Charkov. These Bulletins are issued on the 7th or 8th of each month. To avoid repetition of the full titles the abstracts have been arranged under the authors' names in order of date.]

AVERIN (V.G.). Объ ожидаемомъ появлении вредителей въ 1913 году [On the expected appearance of pests in 1913]. Bull. no. 1, 7th April 1913, pp. 1-6.

The author points out the probability of the appearance of the following insects in great numbers and the necessity of timely preventive remedies against them. His estimates are based on information collected as to these insects during 1912.

*Hyponomeuta malinellus*, which takes the first place amongst orchard pests and which has been prevalent in nearly all parts of the Government, was expected to appear again in large numbers in the current year. It is reported that in some districts the caterpillars were infected before pupating by a small parasite, *Ageniaspis fuscicollis*. *Aporia crataegi*, although not found everywhere, takes the second place, and in some districts it is necessary to guard against it. *Cydia (Carpocapsa) pomonella* was found everywhere, decreasing the harvest of apples by 10-15 per cent. in nearly every orchard, while in some the damage amounted to nearly 50 per cent. *Euproctis chrysorrhoea*, which was a serious pest a few years ago, has nearly disappeared; this may be due to parasites.

*Anthonomus pomorum* was likely to be prominent and injurious to about the same degree as *Cydia pomonella*; while the activities of *Epicometis hirtella*, L., were likely to be limited to a few districts.

The following insects were also expected to appear in more or less large numbers:—*Lymantria dispar*, many larvae of which

perished in 1912 owing to the parasite *Apanteles fulvipes*; *Malacosoma neustria*, whose caterpillars also suffered from parasites; *Rhynchites pauxillus*; *Psylla mali*; *Chortophila brassicae*; *Phlyctaenodes sticticalis*; and *Lethrus apterus*.

The author points out the necessity of early destruction of the nests of *Aporia crataegi* and of *Euproctis chrysorrhoea*, as well as of the eggs of *Lymantria dispar*, mentioning also insecticides for spraying the latter. As to *Anthonomus pomorum* and *Rhynchites pauxillus*, tanglefoot belts are suggested. Timely spraying is recommended against *Psylla mali*, either with tobacco extract (1 lb. in about 5 gals. of water) or with the following decoction of quassia: 3 lb. boiled in about 5 gals. of water; half of the water evaporates, when another 2·7 gals. of water are added and the liquor racked off: 2 lb. of green soap are then added, and the whole made up to 16-17 gals. with water.

Averin (V.G.). Текущія работы въ маѣ [Operations to be undertaken in May].—Bull. no. 2, 8th May 1913, 13 pp.

If no early spraying has been done and the caterpillars of *Aporia crataegi* have appeared in large numbers it is recommended to spray the attacked trees with Paris green (about 5 drams of green in ½ pint of salammoniac, dissolved in about 49 gallons of water). At the end of May a new generation of these caterpillars is likely to appear, when the spraying must be repeated in time. The same remedy is also suggested against *Lymantria dispar*, *Malacosoma neustria* and *Euproctis chrysorrhoea*. Information has reached the Bureau as to the appearance of *Rhynchites giganteus* in one district. For this and other weevils the author recommends shaking the trees over sheets during cool weather in the morning and evening, when the insects are sluggish; this shaking may also bring down the buds attacked by *Anthonomus pomorum*, which buds ought to be collected and destroyed. Spraying with barium chloride (4½ lb. to 27-30 gals. of water) is also suggested; but this is effective only during hot weather when the sun's rays kill the paralysed insects.

*Hyponomeuta malinellus* is reported from all parts of the Government; the caterpillars had already left the mines inside the leaves on the 28th April and settled down in dozens on their surface. Spraying with Djipsin, Paris green, barium chloride, or tobacco extract is recommended. In addition to the usual sprays and tanglefoot belts to protect apples against *Cydia pomonella*, it is recommended that each fruit should be tied up in a small paper bag, the bags being removed shortly before ripening in order to allow the apples to colour.

*Phyllotreta nemorum* has attacked market gardens, and especially seed cabbages, in the district of Charkov; remedies such as fumigating with tobacco in hot-beds, spraying with barium chloride or wormwood extract, the placing of horse-dung between the beds, and the sifting of ashes on the leaves of the cabbages, as well as on the earth, are suggested. The same remedies apply to *Phyllotreta vittata*, Redt.

AVERIN (V.G.). Текущія работы въ іюнѣ [Operations to be undertaken in June].—Bull. no. 3, 7th June 1913, 7 pp.

Reference is made to a serious outbreak of *Phlyctaenodes sticticalis*. The insects appeared in the middle of May, increasing daily, and by the 23rd of the month their numbers reached the maximum. The moths oviposited in enormous quantities, chiefly on the lower sides of the leaves of weeds and market-garden plants (cabbages, cucumbers, pumpkins, melons, &c.) as well as on maize, lucerne, sunflowers and beets; they avoided grasses. The preventive remedies suggested are tanglefoot belts, and spraying with Paris green or azurgin. Destructive remedies:—spraying with tobacco emulsion, carbolic emulsion, barium chloride, or naphtha emulsion. Recipes are given for the preparation of those insecticides, and suggestions are made as to the best forms of sprayers.

*Lophyrus pini* has appeared in many parts of the Government on pines. Trees of 4–8 years are especially subject to its attacks, on which it devours all the needles of the previous year. As remedies, hand-picking, followed by crushing by means of special gloves, and spraying with barium chloride (4½ lb. in 27 gals. of water) are recommended.

Spraying with Paris green proved very effective against *Nematus ventricosus*, the larvae of which have damaged currants. *Phytoptus piri*, the punctures of which cause the so-called "scab" of pears, was reported from one locality. Spraying with tobacco extract (1 lb. in 2·7 gals. of water) as soon as the spots appear is recommended.

*Arctia caja* appeared in a pine forest near Balaklei, attacking various wild and cultivated plants, such as melons, cucumbers, French beans and wild vine. A large percentage of the caterpillars were found dead from some cause unknown. *Retinia buoliana* has also attacked young plantations in the same forest. As a remedy the collection and burning of the attacked plants was practised. *Melolontha hippocastani* was noticed on the wing in the same locality; it did not appear the previous year, but the author remarks that he observed it in great numbers in 1911.

*Lema melanopa* damaged oats and barley in some districts; spraying with Paris green was used against it with some success. *Hyponomeuta malinellus* covered the apple trees with their webs early in the season in all the orchards of the Government. Spraying with barium chloride (4½ lb. in 27-30 gals. of water) proved the most effective remedy. *Aporia crataegi* has seriously injured orchards in one district. The collected material showed only a small percentage of caterpillars and cocoons infested by parasites, so that a heavy flight of the insects may be expected later. It is recommended to spray the trees with Paris green at the end of July, when the small caterpillars will appear. *Rhynchites bacchus* is reported from one district, barium chloride being used as a remedy. In some parts of the district of Charkov, Thrips has damaged rye, about 50 per cent. of the ears being injured.

AVERIN (V. G.). Текущія работы въ іюлѣ [Operations to be undertaken in July].—Bull. no. 4, 8th July 1913, pp. 2–9.

*Aporia crataegi* has appeared in great numbers in many districts of the Government. Only about 55 per cent. of the pupae were healthy and produced butterflies. The remainder were suffering principally from a disease ("pebrin") which was also noticed on the caterpillars; about 7 per cent. of the pupae were infected by Tachinids and only 1 per cent. by other parasites. The most effective remedy is to destroy its winter nests, which can be best done when the trees lose their leaves.

Against *Anisoplia austriaca*, the driving of the insects to the edges of the fields by trailing ropes is suggested.

*Polyphylla fullo*, L., flies from the beginning to the middle of July and their larvae damage various plants on sandy soil, chiefly pine plantations and vines, devouring the roots. It is recommended to cover the earth in vineyards with straw, so as to prevent the insects from ovipositing on the earth. The beetles can be collected by hand, preferably during the morning; they also fly to light.

In one garden in Charkov and in some other places willows were attacked by the larvae of a sawfly, *Nematus salicis*, L. The trees were stripped of their leaves.

The author further reports on a special conference to consider remedial measures against *Phlyctaenodes sticticalis*, convened by the Executive of the Zemstvo Uprava, at which Messrs. Mokrzecki and Kurdjumov were also present. It was agreed that Paris green had not proved effective, while barium chloride was the most radical remedy; as to tobacco extract, while the results obtained were most satisfactory, its cost allows of its use only in the case of crops of high value. The conference also recommended digging trenches round fields; spraying the protecting zones on the edges of the fields with Paris green or azurgin, mowing forage crops threatened by the pest; and covering growing plants with earth, taking care that all caterpillars on these plants should be covered. Tanglefoot bands were also recommended for trees, using a composition prepared from one pound of castor oil and ½ lb. of resin boiled together, constantly stirring the mixture. To fight the insects in their pupal stage, deep ploughing, up to 7 inches, was suggested. It was reported that very few parasites had been noticed in the larvae or pupae. Rooks proved very useful and active in destroying the insects, while near human habitations the same work was done by sparrows.

It has been proved that although devouring all sorts of plants, the caterpillars prefer goosefoot, and straggling beets at a distance from the cultivated plants. In some localities they attacked potatoes and other Solanaceae, also wheat, oats, &c.

AVERIN (V.G.). Текущія работы въ августѣ [Operations to be undertaken in August].—Bull. no. 5, 7th August 1913, pp. 6–9.

From the district of Bogoduchov the station received some pests which injured various vegetables, devouring their roots. These proved to be the larvae of *Tipula* sp. (*oleracea*?), but the exact species could not be established, as all the larvae were infected by Tachinids and none pupated.

In the middle of July poplar trees in the town of Charkov showed a strange colour on their leaves, the latter being covered with whitish spots. It appeared that these spots were caused by caterpillars of *Lithocolletis populifoliella*, Fr., which ate away the parenchyma of the leaves leaving the upper and lower skins untouched. The foliage of some trees was quite dried up. The moths began to emerge on the 21st July.

The flight of the second generation of *Phlyctaenodes sticticalis* began on the 15th July and by 21st July had reached enormous proportions. The damage already done by the first generation was very great, although some districts of the Government, Valkov, Zmievsk, Izium and Kupian, did not seriously suffer. In other districts, Achtyr, Sumsk and Bogoduchov, the larvae destroyed many acres of cultivated plants. Judging by the number of moths, still greater damage might have been expected from the caterpillars of the second generation, but the moths of this generation were practically infertile and few or no caterpillars were observed. This is explained as being due to the rainy weather and low temperature prevailing in the second half of July, which did not allow the normal development of the pupae, thus affecting the reproductive organs of the females. The dissection of some hundreds of females proved that the ovaries were of small size and contained microscopically small eggs, which were not properly formed; the ovaries were also found to be enveloped in fat.

The author deduces that there is no reason to expect large numbers of these insects in the coming year and no danger need be expected in the near future. While no doubt some females oviposited normally and produced descendants, their number must have been too small to be of practical importance.

AVERIN (V.G.). Зерновая совка; Кукурузный мотылекъ [*Trachea (Hadena) basilinea*, Schiff; *Pyrausta nubilalis*, Hb.].—Bull. no. 6, 7th September 1913, pp. 7–8, 11–12.

There were complaints from many localities that the caterpillars of *Trachea basilinea* were damaging wheat in the fields, as well as in sheaf. The following remedies are recommended:—Shake the cut grain before binding into sheaves; the sheaves must not be put in stook on the same field, but on a specially cleaned spot, round which trenches with vertical walls are dug; after threshing, the grain must be effectively winnowed, or, in case of a large number of caterpillars, thoroughly screened

through a sieve, the mesh of which should be fine enough to arrest the caterpillars. If necessary the sheaves may be disinfected by carbon bisulphide in the following way; a hole of suitable size is dug, preferably in loamy soil which does not let the vapours through, which is then lined and also covered with boards, tarpaulin and earth; in such a hole the sheaves are placed, together with vessels containing the insecticide, after which the hole is opened, the air in it well fanned and the wheat removed, when a new heap of sheaves may be put in.

Complaints of injury by *Pyrausta nubilalis* began to reach the Bureau at the end of August. In some localities the number of caterpillars on each plant of maize was 15–20, in others this figure rose to 40–60. The only useful remedy is the destruction of the damaged stalks at the actual time of the pests' activity; but the ploughing of the stubbles, their destruction by fire, &c. may prevent the re-appearance of the insects. It is recommended not to sow millet on maize fields attacked the previous year by this insect.

Averin (V.G.). Осеннія работы по борьбѣ съ вредителями сад.; вредители огородовъ [Autumn operations against orchard pests; pests of market-gardens].—Bull. no. 7, 8th October 1913, pp. 1–4.

Operations against *Cydia pomonella* must be directed to depriving the caterpillars of their wintering abodes. As they usually winter in holes in the trunks, especially near the ground and near the crown of the root, it is recommended to remove all old, cracked bark and to smear the trunk with lime and sulphate of iron (1 lb. of sulphate in 2·7 gals. of lime-water). The caterpillars winter also in cracks in fencing, garden benches, &c., all of which should have boiling water poured over them.

Dry leaves on trees must be collected in autumn and winter and burnt, as they carry the eggs of *Aporia crataegi*. In places where *Malacosoma neustria* were found earlier in the year, the ends of branches bearing rings of eggs must be cut away and burnt. The eggs of *Lymantria dispar* are laid at the foot of tree-trunks and can easily be recognised; they may be destroyed by smearing them over with a brush with kerosene and birch tar or naphtha waste.

Branches containing nests of *Euproctis chysorrhoea* must be cut away and burnt.

After the leaves have fallen, it is recommended to spray the trunks and branches of apple trees with 5 per cent. solution of sulphate of iron against *Hyponomeuta malinellus*.

Against *Psylla mali*, *P. piricola* and Coccids it is useful to smear the trunks and spray the branches with lime-water containing 3–5 per cent. of sulphate of iron.

For *Gryllotalpa vulgaris*, trap-holes are suggested three-quarters filled with horse-dung and covered with earth. They will attract the insects as wintering places, and by digging up the holes in frosty weather during the winter and spreading the dung, they will perish from cold.

It is expected that there will be large numbers of *Pieris rapae* next spring. Re-ploughing of market-gardens in autumn or early in spring to a depth of about 5 inches may be recommended. The same applies to *Barathra* (*Mamestra*) *brassicae*.

*Selandria bipunctata* is a pest of roses; the only remedy is to dig the earth underneath the bushes in autumn or spring, as it is there that the insects hibernate, pupating at a depth of about 2½–4 inches.

Averin (V.G.). О возможности появленія лугового мотылька въ 1914 году [On the possibility of the appearance of *Phlyctaenodes sticticalis*, L., in 1914]. – Bull. no. 7, 8th October 1913, pp. 10–12.

Observations on *P. sticticalis* conducted at the Charkov Bureau showed that some of the caterpillars pupated and emerged in the same summer, the remaining pupae wintering in this stage. Some of the cocoons were opened and proved to contain live caterpillars which had not yet pupated. The same was also observed by Prof. Vassiliev at the station in Smeila. The above phenomenon has been called "diapausa" by Prof. V. P. Pospielov; it consists in a pause in the life of the insect, all life-processes stopping and the insect remaining unchanged during this period. If it be a caterpillar which has formed a cocoon, it remains inside the same without pupating; if it be an emerged female, the diapausa results in sterility, as the development of the ovaries is stopped. If the number of caterpillars in diapausa is great, there may be a fresh invasion of the insects in the next spring. They may pupate in the spring of the next year, emerging soon afterwards, and at the end of the following May a fresh brood of caterpillars would appear. It is impossible to ascertain the general percentage of caterpillars in this state, owing to the small amount of material at disposal, but 5–8 per cent. of the caterpillars were found not to have pupated.

Averin (V. G.) Мелкія извѣстія [Short notes]. Bull. no. 7, 8th October 1913, pp. 15–16.

Between the 18th and 23rd September complaints were received at the Bureau from a few districts as to *Eriocampa adumbrata*, Klug, having seriously injured cherry trees. From another district 37 caterpillars of *Acronycta tridens*, Schiff., were sent, with the statement that they were destroying the leaves of cherry and plum trees. A few days afterwards the author found in the box in which these insects had been placed 18 cocoons of small, and 19 of large parasites.

At the first Russian Congress of Economic Entomologists, which took place from the 20th to the 23rd August in Kiev, N. V. Kurdjumov read a paper on *Oscinis frit*. His observations have shown that this fly, considered up till now as one of the

serious pests of summer crops, is at least harmless. When the sowing takes place at a normal time of the season these flies do not touch the primary stalk, feeding only on the side-shoots. Thus the plant does not suffer and in no way differs from normal plants. The author is even inclined to consider the flies to be useful, as by the destruction of the suckers the nutritive substances concentrate in the primary stalk. Notwithstanding the large material on which the author bases his statements, he is still doubtful as to the accuracy of his deductions and will continue his researches.

VALCH (B.). Текущія работы въ іюлѣ [Operations to be undertaken in July].—Bull. no. 4, 8th July 1913, pp. 4-5 and 11-12.

*Hylemia antiqua*, Mg., were reported as injuring onions in some parts of the Government. The insects fly from spring to late autumn, there being two generations. The remedies suggested in order to prevent the infestation of the plants by the spring generation are, late sowing of onions or late re-planting, in case of biannual cultivation; and against both generations, the spraying of the earth between the plants with lime-water to which some carbolic acid has been added. After the solution has dried there remains on the earth a coating of lime, which, with the smell of the carbolic acid, prevents the insects from ovipositing. The attacked plants ought to be removed and destroyed, together with the earth sticking to the roots, which may contain the larvae and cocoons of the pest.

*Pissodes notatus*, F., last year prevented the afforestation of the sands conducted by the Government, as well as by private persons. Large portions of young plantations, sometimes even the whole of them, perished from the attacks of the weevils. The author says that on some trunks, in cracks as thick as the finger and 7 inches long, as many as 28 cocoons could be found. The only real remedy is to remove and burn the attacked trees. The collection and destruction of the beetles is also recommended.

The author remarking on the method of fighting various pests by hand-picking, which is very prevalent in Russia, such as the collection in winter of the nests of *Aporia crataegi* or *Euproctis chrysorrhoea*, says that this proves very successful and even preferable to applying expensive insecticides. He suggests at the same time the utilisation of this method for fostering the natural enemies of insects. To this end he recommends that the pests collected should not be destroyed, at least the more fully developed caterpillars and pupae, but that they should be placed in boxes covered with fine wire-netting having a mesh which would arrest the pests, but permit the escape of parasites. Such boxes or insectaries when placed in those parts of orchards or market-gardens, which are most attacked by pests, will not require any attention, and the emerged parasites would have fresh victims near at hand. The boxes ought to be left undisturbed for a considerable time, as some parasites require a lengthy period for their development.

VALCH (B.). Мелкія замѣтки [Short notes]. —Bull. no. 6, 7th September 1913, pp. 14–15.

Caterpillars of *Phlyctaenodes palealis*, Schiff., have damaged carrots in some localities. They make a web round the umbels and afterwards proceed to devour the seeds. The only remedy is to cut away and burn the attacked umbels.

During July larvae of *Hylotoma rosarum*, F., appeared on roses in nearly all the gardens round Charkov. Throughout August they pupated, the cocoons being made just below the surface of the earth. This small depth allows of collection by raking them up together with fallen foliage, when they can be destroyed. About 50 per cent. of the caterpillars taken to the laboratory were infected by parasites.

The Director of the Zoological Garden of the Society of Acclimatisation passed on to the author some insects identified by him as *Nematus salicis*, L., second generation. These insects have attacked willows in the garden of the above-named society. The proportion amongst the sexes was one female to a few hundreds of males. The males perished 3-4 days after hatching out. The females oviposited on the same trees on which the former generation appeared, but the larvae on emergence soon perished from some epidemic disease. There were no larvae noticed on the trees in the beginning of September.

VALCH (B.). Вредители капусты въ текущемъ году [Pests of Cabbages during the current year]. Bull. No. 6, 7th Sept., 1913, pp. 12–14.

Since the beginning of July there have been complaints of insects damaging cabbages, principally from the districts of Charkov and Smievsk. At the time of writing they were coming from all parts of the Government. This year proved very favourable to insects and at the end of July and beginning of August, 10 to 15 larvae of *Pieris rapae* were commonly found on one cabbage plant, and later in August the butterflies appeared in enormous quantities. From the end of July eggs of *P. brassicae* appeared on cabbage leaves and the caterpillars being larger and living in companies did great damage; by the end of August, when they started pupating, there was little left of the cabbages except the stalks and veins of the leaves. At the time of writing (the beginning of September) their pupae were to be found everywhere near cabbage gardens, 5 to 10 pupae being found together.

At the end of August caterpillars of various Noctuids appeared, amongst which the author was able to find the following species: *Barathra (Mamestra) brassicae*, L., *Polia oleracea*, L., *Plusia gamma*, L., *Scotogramma (Mamestra) trifolii*, Rott., *Acronycta rumicis*, L. and *Feltia (Agrotis) exclamationis*, L. Caterpillars of *Diacrisia lubricipeda*, L., were also to be seen frequently on cabbage leaves. *B. brassicae*, *P. oleracea* and *Plusia gamma*

proved the most serious pests. As to remedies, insecticides cannot be safely recommended, as the poison may remain in the leaves and prove dangerous to man. Besides hand-picking, for which gloves must be used, as the ejections of the caterpillars are irritating to the skin, it is also recommended to pour over the cabbages hot water at 50°-60° R. (142°-167° F.), after which the plants must be immediately shaken. The hot water will kill the caterpillars, even those hiding amongst the leaves.

VALCH (B. S.). Массовое появленіе капустной совки въ Волчанскомъ уѣздѣ [Outbreak of *Barathra brassicae* L., in the district of Voltchansk, Govt. of Charkov].—Bull. No. 6, 7th Sept., 1913, pp. 1-4.

During the first half of August *Barathra* (*Mamestra*) *brassicae* has appeared in great masses in the district of Voltchansk, damaging cabbage, sugar-beet, forage-beet, &c. In some parts the large leaves of beet were totally devoured, only the thick veins remaining, and a few young leaves in the heart of the plants. The larva pupates in the earth, at a depth of 3 to 4 inches: and on one plantation the author dug up, in a space of 49 square feet, 198 pupae and 46 caterpillars, of which latter 18 were suffering from a bacterial disease. One larva produced on that day a larva of a small Tachinid fly, which immediately pupated. Besides this, there were found in the same soil a number of parasites, which shows that the actual number of caterpillars of *B. brassicae* was larger than the fore-going figures indicate: 81 large intact puparia of Tachinids and 36 from which the flies had emerged; 18 small Tachinid puparia and 45 pupae of other parasites. At the time of writing these pupae had not yet produced any adults. The author calculates that these parasites accounted for at least 141 caterpillar-hosts, so that on calculation, the total number of caterpillars on 49 sq. ft. is brought up to nearly 400. On another plot he found 145 pupae, 28 caterpillars pupating, 18 puparia of large Tachinids, 10 of medium size, 8 of small, and 9 pupae of other parasites.

The favourable weather allowed the plants to recover: the exact amount of damage to the gross harvest and to the proportion of sugar in the beets will only be ascertained later. As to the remedies, the season only permits digging the soil between the beds, when the pupae will be either destroyed at once or exposed and so perish later. The pupae lying on the beds and near the roots will however remain and either winter or produce insects in the present autumn. In the former case the digging and re-ploughing of the ground will kill them, while in the second case the catching of the moths by lights or traps may prove more or less successful; while should the caterpillars appear later, insecticides, such as recommended against *Phlyctaenodes sticticalis*, can be applied.

Much reliance cannot be placed on the natural enemies of the pests, as only 15-36 per cent. of the caterpillars were infected by parasites, and 4-5 per cent. by bacterial disease.

ANDRES (A.). **Note sur un nouveau ravageur du Maïs.** [A new maize pest.]—*Bull. Soc. Entom. d'Egypte, Cairo*, pt. 1, Jan.-March 1913, pp. 20-22.

The pests of maize in Egypt are few and do comparatively little damage. Until recently the best known pests were the cotton-worm (*Prodenia litura*); 'ver du bersim' (*Agrotis ypsilon*); the small cotton-worm (*Laphygma exigua*), which can cause fairly extensive damage by destroying the young shoots; *Pyroderces gossypiella*;* and *Sesamia cretica*, which bores into the maize stems, causing the growth of the plant to be arrested, and killing the stem attacked. The larvae of the newly discovered pest, *Pyrausta nubilalis*, Hb., attack the maize in much the same way, except that they destroy the grain. It is not known yet whether the pest is widely enough spread in Egypt to do important damage. This Pyralid is known also in Europe, where it attacks not only maize, but also hops, millet and hemp.

ANDRES (A.). **Note préliminaire sur un ravageur du riz.** [Introductory note upon a rice pest.] *Bull. Soc. Entom. d'Egypte, Cairo*, pt. 2, April-June 1913, pp. 40-42.

The author had an opportunity of visiting, in May 1912, the neighbourhood of Wekerness, where half the rice harvest had been destroyed by a pest. The cause of the damage proved to be the larva of a fly, *Ephydra macellaria*, Egger. It is found in large numbers on the attacked rice plants, creeping on the young shoots and on the roots of young plants. The pupa fixes itself on the stems or roots. The larvae do not seem to be able to devour the plant, but live on decomposing material, causing a noticeable arrest of growth. The best method to combat them is to flood the fields completely where the fly is prevalent; this kills both the larvae and pupae. It is always necessary to re-sow the rice, but by the time the second crop has appeared the pest will be negligible. A brief description of the larva and pupa is given.

VAN HALL (C. J. J.). *Robusta* **and some Allied Coffee Species.** *Agric. Bull. of the Federated Malay States, Kuala Lumpur*, i, no. 7, Feb. 1913, p. 256.

Among the enemies of Robusta coffee, the "bubuk" (*Xyleborus compactus*) is sometimes the cause of the loss of many branches; but it has always been noticed that after a strong attack it disappears without special measures having been taken. Apparently it is kept in check by its natural enemies, of which a small Hymenopteron (Chalcidid) seems to be the most important. Anguillulids (*Tylenchus acutocaudatus*) in some places render Robusta culture almost impossible. Happily this enemy is not very common, and is confined to special regions. In the last few

* [This is probably not a pest, but merely a rubbish-feeder.—Ed.]

years a Tineid caterpillar has made ravages in the blossoms and the clusters of young fruit. In the dry season, after blossoming, the plants have been much damaged by this pest.

**Allen (W. J.). Fumigation.**—*Agric. Gaz., New South Wales, Sydney*, xxiv, no. 2, Feb. 1913, pp. 153-169, 3 figs.

Owing to the great diversity of opinion which has existed as to the efficiency of spraying solutions in spraying against scale insects, etc., and the necessity of repeating the operation so often, a large number of citrus-growers have substituted fumigation, with highly satisfactory results. As, however, there are still cases which have not been so successful, the present account is given of the exact method of procedure that must be followed and the precautions that must be taken. One of the reasons for failure is the under-estimation of the size of the tree. In measuring the tree it is necessary to get the extreme height and width. This may be done by means of a pole marked out in feet. To estimate the size of a tent to cover a tree of given height and width, the Morrill method may be used; this method is described with the aid of a diagram. Another cause of failure is that fumigation is often done at the wrong time. It is best carried out in February and March for several reasons; firstly, the insect is newly hatched and tender and more liable to be killed by the fumes than when it is older; secondly, the tree is not yet in the critical state when fumigation would harm it. The critical stage is when the fruit is about an inch in diameter which is the case in the late spring or early summer. The work should be done at night, as then there is less danger of harming the tree than during the day. Lemon and mandarin trees stand fumigation better than orange trees; it is recommended only to treat the latter at night or on cool, dull days. The tents must be quite free from holes. Another precaution that must be taken is in weighing out the cyanide, and measuring the sulphuric acid and water, to see that they are in the right proportions and that there is a perfect solution of the whole of the cyanide; lastly, the boiling over of the generator is a source of failure. The method of procedure is as follows:—The water is first poured into the basin or generator, then the sulphuric acid added, and the generator placed well under the tree and away from the tent, so that when the cyanide is dropped in there will be no danger of splashing the tent. When the tent or sheet is over the tree and the sides, with the exception of one place, are held down by earth, the vessel containing the water and sulphuric acid is put under the tree, and then by inserting the arm through the loose part of the tent, the cyanide is dropped in. It is essential that the cyanide be added immediately after the acid and water have been mixed. The arm is withdrawn and the tent made close, the loose part being held down with earth. The tree should remain covered for 45 minutes. Tables are given showing the quantities of cyanide, acid and water required for trees of given size. There are also instructions, with diagrams,

to show how the tent may be made. As regards cost, an example is given, in which 275 trees of various sizes were fumigated, 715¾ oz. of cyanide being used, and a corresponding quantity of sulphuric acid; the work occupied two days with three men; the total cost was £5 3*s*.

FROGGATT (W. W.). **Cicadas as Pests** (*Melampsalta incepta*, **Walk.**).—*Agric. Gaz., New South Wales, Sydney*, xxiv, no. 4, April 1913, pp. 341-344, 3 figs.

The cicadas appear early in November in the neighbourhood of Sydney, where they are only too well known by their incessant screeching. No damage to trees, etc., however, was attributed to them, except that caused by the female when she lays her eggs, slitting open the bark to expose the sapwood. In 1912 the cicadas seemed to be starting out in a new rôle as insects damaging fruit trees. Early in November it was reported that several orchards in the Penrith district had been infested with a small black cicada in such swarms that many peach trees were completely covered; and by puncturing the bark of the trunk and branches, the insects had caused the trees to gum all over, thus doing serious damage. Specimens captured proved on examination to be the common wattle cicada, *Melampsalta incepta*, Walker. In October several specimens of "black flies" were forwarded from Dapto on the South Coast, which were said to be swarming over fruit trees in that neighbourhood. No damage was done although the insect was of the same species. Cicadas also attacked gum trees in the Richmond River district, puncturing the bark and letting out the sap.

ALLEN (W. J.). **Spraying.**—*Agric. Gaz., New South Wales, Sydney*, xxiv, no. 5, May 1913, pp. 431-436.

This is a paper dealing with the practical details of spraying methods in New South Wales. The whole is summarised in a very complete table, which gives the plant, the insects attacking it, the spray to use, when to spray and general remarks.

**Feeding Bees in Winter.**—*Agric. Gaz., New South Wales, Sydney*, xxiv, no. 8, Aug. 1913, p. 710.

In reply to a question from a correspondent as to whether it is advisable to feed bees during the winter, it is stated that bees should not be continuously fed during the winter, but put into winter quarters with enough stores to last until the spring. A mixture of 3 parts of honey to 1 of water should be made and fed to the bees while warm. If available some sort of inside feeder should be used, preferably the Miller or Alexander. If food has to be placed in the open it should be liquid enough to allow the bees to swim in it, and it must have plenty of dry floating material on its surface.

NOEL (P.). **Les ennemis des laitues, des citrouilles, du laurier, des navets et des panais.** [Insect pests of lettuce, vegetable marrows, laurels, turnips, and parsnips.] — *Bull. Lab. Régional d'Entom. Agric., Rouen*, pt. 4, 1913, pp. 4-6, 10-11, 13-16.

The author gives the following lists of the insect pests of the above plants in France, with a brief indication of the damage done.

*Insect Enemies of Lettuces.*

COLEOPTERA: *Rhizotrogus aestivalis*, Oliv., *R. solstitialis*, Latr., *Melolontha melolontha*, L.; all root-feeders.

ORTHOPTERA: *Gryllotalpa vulgaris*, L., eats roots and uproots seedlings.

RHYNCHOTA: *Aphis papaveris*, F., *A. lactucae*, Schrank, *A. sonchi*, L., *Tychea setariae*, Pass., *Pemphigus lactucarius*, Pass., *Trioza flavipennis*, Först., *Eurydema oleracea*, L.

LEPIDOPTERA: *Arctia caja*, L., *A. villica*, L., *Eucharia festiva*, Hüfn., *Diacrisia mendica*, L., *Pericallia matronula*, Hb., *Callimorpha hera*, L., *Cucullia lucifuga*, Schiff., *C. lactucae*, Schiff., *Feltia exclamationis*, L., *Mania maura*, L., *Agrotis plecta*, L., *Episilia festiva*, Schiff., *Euxoa segetum*, Schiff., *Agrotis pronuba*, L., *A. orbona*, Hüfn., *Plusia gamma*, L., *Barathra brassicae*, L., *Scotogramma trifolii*, Rott., *Polia persicariae*, L., *P. suasa*, Schiff., *P. oleracea*, L., *P. advena*, Schiff., *P. dysodea*, Schiff., *Xylina exoleta*, L., *Antitype chi*, L., *Haemerosia renalis*, Hb., *Euplexia lucipara*, L., *Zanclognatha tarsicrinalis*, Kn., *Z. tarsiplumalis*, Hb., *Gnophos pullata*, Tr., *G. obscuraria*, Hb., *Eucosma conterminana*, F.R., *Plutella maculipennis*, Curt.

DIPTERA: *Urellia amoena*, Frfld., *Chortophila gnara*, Mg.

ACARI: *Eriophyes lactucae*, Can.

*Insect Enemies of Vegetable Marrow.*

COLEOPTERA: *Lagria hirta*, L., *Epilachna chrysomelina*, F.

LEPIDOPTERA: *Phtheochroa rugosana*, Hb., *Tortrix podana*, Sc.

DIPTERA: *Orellia wiedemanni*, Mg., *Agromyza bryoniae*, sp. n., *Dasyneura bryoniae*, Bouché.

*Insect Enemies of Turnips.*

COLEOPTERA: *Ceuthorrhynchus sulcicollis*, Payk., *Baris chloris*, F., *Entomoscelis adonidis*, Pall., *Psylliodes chrysocephala*, L.

RHYNCHOTA: *Trioza nigricornis*.

LEPIDOPTERA: *Pieris napi*, L.

*Insect Enemies of Parsnips.*

COLEOPTERA: *Phytoecia ephippium*, F.

RHYNCHOTA: *Aphis capreae*, F., *Capsus pastinaceae*, Fall.

LEPIDOPTERA: *Loxopera dilucidana*, Steph., *Depressaria hofmanni*, Stt., *D. depressella*, F., *D. nervosa*, Hw., *D. heracleana*, de G., *D. badiella*, Hb., *Epermenia choerophyllella*, Stt.

DIPTERA: *Acidia heraclei*, L., *Schizomyia pimpinellae*, F. Löw, *Contarinia pastinaceae*, Rübs., *Macrolabis corrugans*, F. Löw.

CAMERON (A. E.). **General Survey of the Insect Fauna of the Soil within a limited area near Manchester. A consideration of the Relationships between Soil Insects and the Physical Conditions of their Habitat.**—*Jl. Econ. Biol., Birmingham*, viii, pt. 3, Sept. 1913, pp. 159-204, 3 figs., 2 pls.

The first part of this paper deals with the insect fauna of the soil at the grounds of the experimental laboratory at Fallowfield, near Manchester, with a general description of the locality, the methods used for collecting insects for examination, and the flora of the grounds. A list is given of 32 plants which are the hosts of insects or their larvae, and with each plant is mentioned the name of the particular insect infesting it: the list is followed by a more detailed description of the insects. Some 163 insects are mentioned. In the experiments, it was noted what parasites prey upon particular insects, and a list of parasitic Hymenoptera is given, containing 18 species referable to 5 families.

The second part of the paper deals with the varying conditions of soils and their effects upon soil insects. The question of moisture is first dealt with. Water is present in the soil in three conditions: gravitational, capillary and hygroscopic. Of these three, gravitational water is the most abundant, and the most destructive of insect life within the soil. Artificial flooding of areas is resorted to in checking soil pests, but it cannot be said to be a universal remedy. The author kept specimens of the larvae of *Agriotes lineatus* in water for six days, without their being killed; but those kept in water for eight days did not survive. The presence of capillary moisture is the most favourable to soil insects; when it is absent, for example after digging or hoeing in a dry season, insects either die, or penetrate lower down in the soil below the root zone. The relation of temperature to the condition of the soil is discussed, and it is pointed out that varying conditions of weather have an important bearing on various insect pests, and the author is of the opinion that definite meteorological observations, carried out in association with entomological work, would solve many questions relating to sudden outbreaks of pests, such as "leather-jackets" (*Tipula*) and wireworms (ELATERIDAE). Soil ventilation and its bearing upon insect life is dealt with: mention is made of the drainage which is indirectly caused by pests such as wireworms or leather-jackets boring into the soil and thus leaving an exposed surface to the air, which robs it of its moisture. It is said that in some cases the application of artificial manures, such as lime, is advantageous in increasing the permeability of a heavy soil, and lime, used as a fertiliser, renders the soil unsuitable to insect pests. A bibliography of works consulted is given.

MALLOCH (J. R.). **A Revision of the Species in** *Agromyza*, **Fallen, and** *Cerodontha*, **Rondani (Diptera).**—*Ann. Entom. Soc. America, Columbus*, vi, no. 3, Sept. 1913, pp. 269-335, 4 pl.

This is a review of the classification and nomenclature of the flies of the genera *Agromyza*, Fallen, and *Cerodontha*, Rondani, many of which are pests of crops. The revision is made in consequence of the confusion that has arisen in the case of the same or synonymous names being applied to different insects in America and Europe.

KRAUSSE (A.). *Camponotus herculeanus vagus*, **Scop., als Korkschädling.** [*Camponotus herculeanus vagus* damaging cork.]—*Archiv. für Naturgeschichte, Berlin*, lxxix, pt. 6, 1913, pp. 34-35, 2 pl.

*Camponotus herculeanus* is one of the largest of Sardinian ants. It builds its nest in old dead trees, as well as in living ones. Very frequently it settles in the bark of the cork tree, usually in trees about 18 inches in diameter, and eats into the more valuable new layers of the cork; in this respect differing from *Cremastogaster scutellaris*, which eats only into the, technically speaking, valueless layers of cork. Inside the cork it hollows out large chambers and passages, making the cork quite useless.

SCHNEIDER-ORELLI (O.). **Ueber wurmistichige Flaschenkorke.** [On worm-bored bottle corks.]—*Schweiz. Zeits. für Obst- und Wein-bau*, xxii, no. 22, 24th Oct. 1913, pp. 305-307.

Damage is frequently caused by insects laying their eggs in the corks of bottles; the eggs hatch, and the maggots eat into the cork, often causing the wine to escape or allowing an inlet to moulds which destroy the wine. The matter has been dealt with by Feytaud in the "Revue de Viticulture" (Vol. xxxiii, p. 113). That the eggs are not already in the corks when they are put into bottles is certain, as the corks are boiled for 30-40 minutes to increase their elasticity. The author examined the maggot which infested the corks of bottles containing, for the sake of experiment, sterilised grape- and fruit-juice. The corks themselves had an incrustation, and in many cases they were tunnelled through, allowing the wine to escape. At the peripheral parts of the cork there were irregular, branched tunnels, out of which came small yellowish-white moths, about 10 mm. in length. These were identified as the corn moth (*Tinea granella*, L.) that causes considerable damage in granaries. In other corks a beetle, *Corticaria crenulata*, Gyll., was found.

To prevent the entry of the moth, nothing is better than a metal covering to the cork; lacquer is also useful, provided it

does not crack: in some cases a layer of paraffin wax may be used. Sulphur fumigations are useful in killing the moth and in preventing the spread of the damage.

Woodhouse (E. J.) & Dutt (H. L.). **Further work against surface caterpillars at Mokameh in 1912.** *Agric. Journ. of India, Calcutta*, viii, pt. 4, Oct. 1913, 18 pp., 1 pl., 2 maps.

An account is given of a campaign in which the Andres-Maire moth-traps were used on a large scale to check the damage caused annually by *Agrotis* on ten-thousand acres of the Mokameh tal. The Andres-Maire trap, imported from Egypt, is constructed to attract moths by sugary solutions into a cage from which they cannot escape. The traps are raised some four feet off the ground in order to increase the distance to which the scent of the attractive liquid is carried. So far as they affect the question, the life habits of the insect (*Agrotis ypsilon*) are given. The pest is active during the cold weather in the Gangetic plain, and as nothing is known of its whereabouts during the hot weather, it is supposed that it aestivates in the Himalayas. The moth is a strong flyer, not usually attracted by light, and lives some time as an adult. It lays its eggs chiefly in newly-ploughed or irrigated soil. The caterpillar lies hidden in cracks in the soil by day and feeds at night by cutting off the stems of young plants. The extent of the damage caused by the caterpillar depends on the fact that it is not content with making a meal off the first plant it cuts down, but moves about, cutting off a large number of leaves in the course of a night. In spring the life-history takes about six weeks, but there is evidence to show that this is reduced to a month in the autumn. The female lays about 300 eggs. It is claimed that the traps have been completely successful in checking the pest. In the year under review less than one hundred acres were damaged by *Agrotis*, while more than sufficient insects were killed than would account for the damage that would have been caused on the remainder of the area, to judge from the experience of previous years. The traps appear to be more efficient at Mokameh than in Egypt, because they attract all the *Agrotis* moths within a very wide radius: they attract gravid females as well as males. In view of the egg-laying habits of the female, great stress is laid on the importance of getting the traps on to the low lands while these are still wet, as previous experience showed that the moths lay their eggs on these lands while they are still muddy. The number of moths that escape from the traps is small and probably 1 in 200, but the resulting caterpillars are usually found near the traps and can therefore be more easily found and destroyed. It is claimed that a crop worth over £20,000 has been saved by the investment of £255 in preventive measures.

One table gives the number of males and females caught, the weather conditions, &c., from March to December, 1912. A second table contains a statement of the caterpillar attacks in different fields, at different distances from the traps. A third

gives the proportion of males and females caught. It shows that the proportion of females was 56·5 per cent., 52·1 per cent., and 38·4 per cent. for the months of December, November, and September. Another table shows the distances apart of the traps, which varied from 410 yards to 2,800 yards. There is also a map of the district showing the positions of the traps.

Misra (C. S.). **The Red Spider on Jute** (*Tetranychus bioculatus*, **Wood-Mason**).—*Agric. Journ. of India, Calcutta*, viii, pt. 4, Oct. 1913, pp. 309-316, 1 pl.

The discoloration of the jute leaves frequently observed in the fields and in experimental plots is due to a phytophagous mite called the Red Spider, or Spinning Mite (*Tetranychus bioculatus*). It repeatedly punctures the leaves of the plant, sucking some of the sap; more damage is done by the sap which runs to waste than by the loss of that which the mite actually uses for food. The waste sap decomposes and forms a stoppage in the sap channels which nourish the rest of the leaf. The infested leaves turn a deep coppery green colour, curling over and becoming very crisp. This Red Spider is also found on cotton, castor, mulberry, orange, indigo, *Triumfetta neglecta*, *Urena lobata*, *Hibiscus ficulneus*, *H. panduriformis*, and *H. abelmoscus*.

It has been under observation since 1909, when it was noticed on the jute for the first time. In May-June 1910, it attacked castor. Last year the spider was found to hibernate in the adult stage on the lower surface of castor leaves. The adults remain inactive until February, after which they copulate and lay eggs. They increase extremely during April, May and June. The adults lay eggs the day after reaching maturity. Each female lays from 80-90 eggs, the larva emerging within 4-5 days after the eggs are laid. On hatching, the larva begins to feed, and spins a web all round itself. A few days later it undergoes metamorphosis and emerges as an adult, the whole life-history occupying only 8-9 days. Starting from a fertilised female on the 1st March, there will be 3,500,000 spiders ready to reproduce at the end of the month, provided the weather conditions are suitable. Thus it is evident that if measures are to be taken to combat the pest, they should be taken early to prevent this enormous increase.

There are five known parasites upon the mite: a small ladybird beetle (*Clanis soror*, Ws.), a small black Staphylinid beetle, a small Coccinellid or Corylophid beetle, a species of *Scymnus*, and *Brumus suturalis*, F.

Rain is fatal to the Red Spider; a shower has frequently been observed to wash away and kill numbers of them from infested trees. From this it follows that plants sprayed with sufficient cold water would be freed from the pest. In nurseries and with plants in pots, much good is done by fumigating the affected parts with burning sulphur. But this is impossible in the open, and in this case a good remedy is either dusting the plants with flowers of sulphur, or spraying them with a mixture of flowers of sulphur and crude oil emulsion. Roll sulphur, no matter how

finely powdered, must not be used, as it invariably clogs the nozzles of the spraying machine. The following formula is given:—crude oil emulsion, ½ pint; flowers of sulphur, 2 ozs.; water, 4 gals. The sulphur should be thoroughly mixed with the emulsion. High pressure sprays should, if possible, be used, in order to penetrate the webs inside which the nymphs are protected. If there still remain mites after the first spraying, the process should be repeated with twice the quantity of sulphur.

The paper concludes with a table giving the size of the plot treated, the formula for the spray, the machine used, the time taken, and the labour and cost. Five plots of $\frac{1}{10}$ acre each were sprayed with liquid prepared as given above, with a Gould's Standard Spray Pump, mounted on a cart. The time taken was two hours, and the total cost for four men and material for spray liquid was 2*s.* 6*d.*

COVENTRY (B.). **Report of the Director.**—*Report of the Agric. Research Inst. & Coll., Pusa*, 1911-1912, *Calcutta*, 1913, pp. 9-10.

Reporting upon the entomological work done during 1911-1912, the Director says that a campaign has been carried out against the Deccan Grasshopper. The method known as "bagging" was adopted more or less successfully, and the infested lands were ploughed up. A leaflet was issued describing the methods to be adopted against this pest. Experiments against termites were continued in the Central Provinces; the application of kerosene oil was found most effective in dealing with the mound-building species. The collection and despatch to the Punjab of parasites of the cotton boll-worm formed an important part of the work of the Institute, as dependence is placed upon this parasite in order to keep down the pest. In the United Provinces measures were adopted against the Rice Grasshopper, which has become a serious pest of sugar-cane in that region. The method of storing seed potatoes in sand as a protection against the Potato Moth was successfully demonstrated to cultivators in Bengal. At Mokameh a campaign was organised against *Agrotis ypsilon*, which had been destroying crops. Hand-picking of the first brood of caterpillars and the setting up of the Andres-Maire traps reduced the damage to such an extent that out of a total area of 20,000 only 2,000 bigahs were affected. Experiments are being conducted in breeding hybrids between the Indian multivoltine variety of mulberry silk-worm and univoltine races from Europe. If this work is successful, it is said that it will go a long way towards placing the Indian silk industry on a more stable footing.

HEADLEE (T. J.). **A Brood Study of the Codling Moth.**—*Journ. Econ. Entom., Concord*, vi, no. 5, Oct. 1913, pp. 389-395, 4 figs.

No point of the life-history of the codling moth (*Cydia* (*Carpocapsa*) *pomonella*) is more important, from the standpoint of control, than the number and succession of broods; for these

factors determine the periods during which fruit and foliage must be kept covered with a poisonous coating. According to all accounts there are two broods: the object of the present experiments were to demonstrate the presence or absence of a third brood. The results of the experiments are represented by curves. Three separate and distinct emergences of adult moths are shewn; three definite egg-laying periods are indicated, also three distinct pupation periods; while only two distinct larval emergences are represented. Thus it appears that in 1912, in the course of the out-door tree-cage studies at Manhattan, three distinct and successive appearances of each of the moth's stages, except the larval, were determined. The third emergence of the larva would come during September and October. The fact that only 48 per cent. of the larvae of the second brood pupated shows that the third brood is only partial. The conclusion therefore is that there are two complete broods and a third partial brood.

Davidson (W. M.). **On the pupal instar of the Fruit-tree Leaf-roller (*Archips argyrospila*, Walker).**—*Journ. Econ. Entom., Concord*, vi, no. 5, Oct. 1913, pp. 396-398.

During the summer of 1911 the author found occasion to study the pupal instar of the Fruit-tree Leaf-roller at San Jose, California. He found that the maximum pupation took place about 20th May. Live pupae were found as early as 24th April and as late as 1st July. The average pupal period was 19.9 days. From the results obtained by Gillette and Weldon, it appears that the whole process occurs about a month earlier in California than in Colorado, and that the pupal instar occupies almost double the number of days in the former state. A comparison of the climatic conditions in the two states might throw light on the question.

Severin (H. H. P.). **The Life-History of the Mediterranean Fruit Fly (*Ceratitis capitata*, Wied.), with a list of the Fruits Attacked.**—*Journ. Econ. Entom., Concord*, vi, no. 5, Oct. 1913, pp. 399-403, 2 pl.

This paper gives an account of the life-history of the Mediterranean fruit fly, as worked out upon the tropical almond (*Terminalia cattapa*) in Hawaii. In ovipositing the fly forms a small receptacle in the fruit with the proboscis into which the eggs are laid, being then covered with a gelatinous secretion by the fly. In some unripe fruits this secretion prevents further growth of tissue in this region, and results in the formation of a depression on the surface of the fruit. The number of eggs deposited within a receptacle varies from 1-42. It often happens that the fly is unable to withdraw its ovipositor from the fruit, and dies in this position. Eggs laid in the ripe tropical almond hatch in 2-3 days, but the period is prolonged when they are laid in green fruits. The larvae work their way into the pulp of the fruit, which soon begins to decay and drops to the ground. The larval period lasts from 8-17 days, and then the maggots bore out and

enter the ground to pupate. The total number of maggots found in 25 infested almonds gathered at random was 1,380. The largest number of adult flies bred from a single almond was 60 (28 males and 32 females). The maggots rarely pupate within the fruit. The pupal period lasts from 15-17 days, and the flies are not mature for 11-14 days after they emerge.

A list is compiled of the trees which are subject to attacks by this fruit fly. It contains 38 names including most of the important fruit trees in the Hawaiian Islands. The following, however, are said to be immune:—Breadfruit (*Artocarpus incisa*), rough-skin lemon (*Citrus medica*, var.), "noni" (*Morinda citrifolia*), mulberry (*Morus nigra*), pomegranate (*Punica granatum*), and tamarind (*Tamarindus indica*).

EWING (H. E.). **Notes on Oregon Coccinellidae.** *Journ. Econ. Entom., Concord*, vi, no. 5, Oct. 1913, pp. 404-407.

This is an account of the COCCINELLIDAE of Oregon made from field notes and laboratory records taken by the author during the past two years. Various laboratory experiments were made to test their fecundity, the stability of varieties, and the economic value of different forms. The most abundant species found in Oregon is *Hippodamia convergens*, Guér., followed by *H. spuria*, Lec. Next in numbers, though probably not in importance, is *Coccinella novemnotata*, Hbst. Then come *Chilocorus bivulnerus*, Muls., and *Cycloneda sanguinea*, L., which if not so abundant as *C. novemnotata*, attack more serious pests. *Psyllobora taedata*, Lec., is abundant among the foothills and mountains in summer, but is of no special economic value. *Smilia misella*, Lec., does good work in the Willamette Valley against the San José scale. *Adalia bipunctata*, L., *Hippodamia parenthesis*, Say, and *Coccinella transversoguttata*, Fald., are present in large numbers, but are never of economic importance.

Late in July or early in August many of the common Coccinellids run short of aphid food, and for a while are found in great numbers feeding upon the pollen of various plants. By the middle of August a definite migration commences; they leave the hot, dry valleys and move upward, many of them never stopping until the highest point is reached, and there they hibernate. Thousands were found in September on the summit of Mount Chintimini, the highest point in the Coast Range mountains. A list is given showing the dates of emergence of the first of each species, taken at Corvallis, 230 miles above sea level, in 1913. A *Chilocorus bivulnerus* emerged on 10th Feb.; other species emerged during April up till the 21st. By the time they reach the valleys abundance of food is ready for them, as the aphids usually hatch in March, and are mature by the middle of April. This food supply is cut short by the middle of May, by the voracious appetites of the Coccinellids aided by other enemies, notably the Syrphid fly larvae and a Lampyrid beetle (*Podabrus pruinosus*, Lec.).

There is a preference shown by most Coccinellids for certain species of APHIDIDAE. Among the most sought are:—The Black

Cherry Aphis (*Myzus cerasi*, F.), Snowball Aphis (*Aphis viburni*, Scop.), Rosy Apple Aphis (*Aphis sorbi*, Kalt.), and European Grain Aphis (*Aphis avenae*, F.). On the other hand such aphids as the Green Apple Aphis (*Aphis pomi*, de G.) and the Woolly Apple Aphis (*Eriosoma lanigera*, Haus.) are not nearly so much relished.

WATSON (J. R.). **An Unusual Type of Injury due to a Thrips.**—*Journ. Econ. Entom., Concord*, vi, no. 5, Oct. 1913, pp. 413-414, 1 pl.

The author has observed an unusual type of injury to camphor trees in Florida due to *Cryptothrips floridensis*, Watson. In the beginning of the infestation, the eggs are laid between the scales of the terminal bud. If the bud has commenced to develop when the eggs hatch, the larvae first attack the new growth. If there are but few larvae on each bud, there will result a blackening and deforming of one side of the young leaves. If there are many larvae on the bud, the bud will be killed outright. The insects then attack the younger twigs, where they feed in groups. The bark where these groups feed is killed, and as it dries, it cracks. The adults use these cracks as means of entrance to the cambium, where they lay their eggs. As the infestation proceeds, the bark on all the twigs is killed and the leaves are shed. This leaves the cambium as the only suitable breeding place, and here the larvae, as well as the adults, are to be found. The work on the cambium is continued until the whole plant is killed. The insect seems to be incapable of flight, although it has well-developed wings. It is probably spread from plant to plant by means of workmen and horses, and by crawling over the ground. It was found on large trees at Satsuma, near Palatka, and at Tampa, but it seems to do very little harm to these. It is the younger seedlings in the nursery, and the young trees in the field that are killed. It is a question whether this insect is a native species which has spread to the camphor, or whether it was imported with the camphor, which is not a native plant of Florida.

Tobacco decoction kills the pest, but it must be made stronger than for most species. For the adults, the liquid now in use is made up of half a gallon of whale oil soap; half a gallon of commercial lime-sulphur; and half a pound of Black Leaf 40, to 50 gallons of water. This has proved efficient, though it does not kill the eggs, nor the adults and larvae hidden under the bark. By spraying not later than the stage when the larvae are mostly in the buds or on the outside of the twigs, and by cutting out the trees in the later stages of infestation, it was found possible to control this pest.

**A Destructive Root Mite.**—*Agric. Gaz., N.S. Wales, Sydney*, xxiv, no. 1, Jan. 1913, p. 71.

In an editorial note reference is made to a report in the *South Australian Journal of Agriculture* that at Mount Barker the "bulb mite," *Rhizoglyphus echinopus*, has been found in large

numbers upon French beans. This small semi-transparent mite, attacks stored onions and bulbs, carrots, fruit trees, and various roots and seedlings. The attacked surface appears to be covered with a greasy dust. When once attacked, the plant is nearly always doomed. In apple roots the bark softens and readily tears off, when swarms of mites are seen. Sulphur will prevent the mites attacking stored bulbs and cuttings, but once they have gained access to the roots, nothing economically practicable can be done against them.

**Excessive Spraying with Red Oil Emulsion.**—*Agric. Gaz. N.S. Wales, Sydney*, xxiv, no. 2, Feb. 1913, p. 151.

In an editorial note, a report is given upon the cause of death of apple trees in a carefully tended orchard. The trees had been sprayed with Red Oil against the Woolly Aphis (*Eriosoma lanigera*), and death was probably due to excessive spraying. On unearthing the bole of the tree it was found that the bark of the most seriously affected trees had been entirely destroyed. It appears that the red oil emulsion had run down the stem of the tree, soaked into the ground, and as the water evaporated, the concentrated oil had destroyed the bark at the foot of the tree. It is possible that the spray in the barrel had not been kept thoroughly emulsified during the spraying, in which case the first trees sprayed would get a very weak solution and the last a very strong one.

FROGGATT (W. W.). **White Ants in Orchards.**—*Agric. Gaz. N.S. Wales, Sydney*, xxiv, no. 8, Aug. 1913, p. 728.

White ants are difficult to deal with in an orchard, as poisons that will kill them kill the plant also. When planting, care should be taken that all damaged roots are cut away. Deep planting is a mistake, if the scar of the graft is brought underground, as the scar is a likely place for the attack of termites. All stumps and dead wood should be removed from an orchard, as they tend to harbour the pest. Where the ground is well worked round the trees, white ants seldom do any damage. When they are found about the roots of a fruit-tree a few pounds of kainit dug in will drive them away, and also act as a manure.

**Cut-Worms.**—*Journ. of the Dept. of Agric. of Victoria, Melbourne*, xi, pt. 9, Sept. 1913, pp. 533-534.

*Agrotis* and other allied caterpillars, have proved by far the worst scourge with which Victorian vine-growers have had to contend. Where active steps have not been taken to combat them, complete failure of an otherwise faultless plantation has several times occurred. The methods detailed in the *Journal* for July 1911, have proved satisfactory, especially the use of arsenical bait. A new method of control described in *Le Progrès Agricole*

of 20th July 1913, has proved very satisfactory in the south of France. This method comprises two distinct phases, (1) the attraction of the caterpillars by means of vegetable baits; and (2) their ultimate destruction with a corrosive liquid. The first phase has been practised for some time. The bait recommended is a small patch of peas which should be sown near the vine and early enough to be up before the latter begins to grow. Cut-worms will leave the vine for the peas. The second phase, the destruction of the worms by means of a liquid, is new. Various liquids were tried, many of which failed to wet the skin of the larvae. A 3 per cent. solution of commercial cresyline or creoline was finally adopted and proved entirely successful, the larvae being readily wetted by it. About a pint of this solution to a patch of peas is sufficient. It can be most conveniently applied with a spray pump with a worn nozzle, such as will produce a shower rather than a spray. Lest the creoline should damage the young vine, the peas should be planted at least two feet away from it. The cost of treatment is estimated at 2*s*. 8*d*. per acre, for pea-seed and labour, and 8*s*. an acre for destroying the grubs, *i.e.*, for solution and labour. This is based on 1,760 vines per acre.

French (C.), jun. **The Metallic Flea-Beetle (*Haltica pagana*): a New Strawberry Pest.**—*Jl. Agric. of Victoria, Melbourne*, xi, pt. 10, Oct. 1913, p. 591.

During the last few months, strawberry-growers in the Wandin and Evelyn districts have complained of losses through the depredations of insects, which are small in size, and of a purple metallic colour. They swarm in great numbers on the strawberry plants, making numerous small holes in the leaves and young flower buds, and causing them to wither. The trouble was found to be due to the Metallic Flea-beetle (*Haltica pagana*) a native insect which formerly fed on the leaves of the "Sheep Burrs" (*Acaena ovina* and *A. sanguisorbae*). As raspberries, apples, pears, etc., belong to the same natural order, growers should be on the watch for these insects. Arsenate of lead spray is an excellent remedy against the pest, but it should not be used whilst the plants are fruiting. A deterrent such as benzol emulsion could be used. Kerosene emulsion is also a useful spray. Numbers of these insects could be shaken off the plants into shallow tin dishes containing some sticky substance.

Quaintance (A. L.). **Remarks on Some of the Injurious Insects of Other Countries.**—*Proc. Entom. Soc., Washington*, xv, no. 2, June 1913, pp. 53-88.

The annual presidential address reported in this number is a survey of the injurious insects of numerous countries outside the United States, given under headings arranged according to the orders of insects. The subject is dealt with in a comprehensive manner, and with each insect is mentioned its methods of attack and its host plants.

HOOD (J. D.). **Nine New Thysanoptera from the United States.**—*Proc. Bio. Soc., Washington*, xxvi, June 1913, pp. 161-166.

Nine new species of Thrips are described. One is of economic importance, viz., *Liothrips montanus*, sp. nov.: fourteen females and two males were taken on currant and gooseberry bushes at Bozeman, Montana.

KLEINE (R.). **Die Kümmelmotte,** *Schistodepressaria nervosa*, **Hw.**—*Zeitsch. für Wissen. Insektenbiol., Berlin*, ix, nos. 5, 6, & 7, 1st July 1913, pp. 183-190, 2 figs.

This is an account of the biology and economic significance of the caraway-seed moth, *Schistodepressaria nervosa*, Hw. [see this *Review*, Ser. A, i, p. 159]. The insect hibernates as an imago in some umbelliferous plant, and in the spring it lays its eggs on the leaves of the caraway-seed plant. The caterpillar eats into the stem, inside which it pupates, thus impoverishing the blossom and preventing the formation of the seed.

The author says that the only method of attacking the pest is to destroy the moths at the end of the life-cycle, *i.e.*, before they hibernate. In carrying this out, use should be made of the fact that the emergence of the moth occurs a few days later than the time when the seed is ready to be gathered. The cutting should be at the earliest possible date, and the thrashing of the seed as soon after that as possible, and what remains of the plant after thrashing should be burned at once. A list of parasites of the insect are given. The most important are: *Cryptus profligator*, Grav., *Ophion vulneratus*, Grav., *Microgaster* sp., *Eulimneria costalis*, Thoms., and *Litomastix truncatella*, Dalm.

SCHERDLIN (P.). **Einiges über den Apfelwurm** (*Carpocapsa pomonella*). [The apple worm, *Cydia pomonella*.] *Internat. Entom. Zeits., Guben*, vii, no. 18, 2nd Aug. 1913, pp. 121-123.

This article deals with the morphology and life-history of the codling moth *Cydia* (*Carpocapsa*) *pomonella*, L., and the usual remedies are recommended.

HOLLOWAY (T. E.). **Some Methods of Handling Minute Hymenopterous Parasites.**—*Journ. Econ. Entom., Concord*, vi, no. 4, Aug. 1913, pp. 341-344.

This is an account of the methods used by the author in dealing with the hymenopterous egg-parasites *Trichogramma minutum* (*pretiosa*), Riley, and *Telenomus* sp. (probably *heliothidis*, Ashm.). The easiest way of collecting these small insects is to breed them from the parasitised eggs. These eggs, separated from the plants on which they have been laid, should be put into glass tubes about 8 mm. wide by 24 mm. long, about

10-15 eggs in a tube. A piece of fine cotton-wool makes a good stopper. The larvae of the unparasitised eggs, which will be the first to emerge, should be removed from the tube. The parasites may be expected to emerge within a short time after the eggs turn black, and sometimes several adults of *Trichogramma* emerge from one egg. These may be fed by moistening the sides of the tube with a weak sugar solution; only a very small amount of the solution is necessary (not more than can be observed with the aid of a lens), and the solution must not be sticky. The host eggs are given about 24 hours after the males and females have emerged. When it is desired to have the parasites oviposit, they may be introduced into tubes (8 mm. by 24 mm.) in which a number of host eggs and a minute drop of the sugar solution have been placed. In transferring the parasites from one tube to another, it was found best to place the tubes on a smooth white surface so that the insects might easily be observed. A plate of glass, 5″ × 7″ with a piece of white paper glued to the underside, was used for this purpose. A few parasites were allowed to come out on the glass plate and they were then made to walk or jump into the proper tube, which was held open for them. If necessary, the parasites were touched very slightly with a camel's hair brush to make them go in the right direction. The males may be left out of account. It was found most convenient to place two or three females in a tube containing about 50 eggs. Use may be made of the fact that the parasites travel towards the light. The tubes should be kept in a suitable tray on a piece of white paper, so that the insects may be observed.

For shipment, the tubes containing parasitised eggs may be packed in card-board post boxes. Cotton-wool should be placed round the eggs to prevent them from shaking in the tube, and each tube should be packed in cotton in another larger tube. If cold storage is used, care should be taken not to subject the eggs suddenly to a much higher temperature; to avoid this the cases should be transferred from the cold room to thermos jars and conveyed in those jars to the laboratory, and they should be left there for about 24 hours before unpacking.

TOWNSEND (C. H. T.). **The Peruvian Fruit Fly** (*Anastrepha peruviana*, **n.sp.**).—*Journ. Econ. Entom., Concord*, vi. no. 4, Aug. 1913, pp. 345-346.

Wormy fruits have long been known in the Peruvian coast region. The injury seems most acute during February, at the time when peaches, guavas, cherimoyas and other fruits are ripening. The fly is a general fruit pest, attacking not only deciduous fruits but citrus fruits as well. Peach and guava trees are often so completely infested that it is often impossible to find a single sound fruit on the tree during February. The species is a new one, and is described under the name of *Anastrepha peruviana*. The author recommends as a remedy a spray modelled after the Mally fruit fly spray used in S. Africa, applied to the foliage before the fruits begin to ripen, to

soon as the presence of the flies is noted. The formula most convenient for use in Peru is lead arsenate 5-10 lbs., chancaca (brown or black cane sugar in cakes) 25-50 lbs., and water 100 gallons. The chancaca is dissolved in boiling water before adding the arsenate solution. The amount of arsenate is varied according to the kind of foliage, guava and orange standing much more than peach; the sugar content should increase in the same proportion as the arsenate.

SEVERIN (H. P.) & SEVERIN (H. C.). **A historical account of the Use of Kerosene to Trap the Mediterranean Fruit Fly** (*Ceratitis capitata*, **Wied.**).—*Journ Econ. Entom., Concord*, vi, no. 4, Aug. 1913, pp. 347-351, 1 fig.

This paper contains the result of experiments made to control the Mediterranean fruit fly (*Ceratitis capitata*, Wied.) by means of kerosene traps, followed by an historical account of this method as practised or recommended in other parts of the world. The attempt by the authors to check the fly by this means was a complete failure. They attribute this to the fact that the proportion of females to males caught was very small, only 1 in 200. Entomologists have strongly recommended the use of the kerosene trap in other parts of the world, notably in Australia, on the grounds that many flies are caught by such traps, but in most cases the proportion of females to males has been ignored.

DEW (J. A.). **Fall Army Worm** (*Laphygma frugiperda*).—*Journ. Econ. Entom., Concord*, vi, no. 4, Aug. 1913, pp. 361-366.

This paper sets out the information obtained during the outbreak in Alabama last year, by experiments conducted by the Alabama Experiment Station. A list is given of the observed food-plants of *L. frugiperda*, which includes most of the commonly cultivated crops; the only common plants upon which no larvae were seen feeding were Cucurbitaceae, such as, watermelon, squash, pumpkin, etc. The first appearance of adults recorded in Alabama was on 4th May 1912. On 15th May ravages by the larvae in the Mobile district and from other parts of South Alabama were reported. General pupation occurred from 20th May to 1st June. The life-cycle was completed again during the next thirty days and in July the infestation was very wide-spread. Two other generations were completed, one in August and one in September. Occasional larvae were found in October and November; specimens have been observed hibernating in the larval, pupal and adult stages, about 80 per cent. as pupae. The life-history is briefly as follows. The female lays her eggs in clusters of 60-500, upon the leaves of corn, cotton, etc., covering the mass with down composed of silken threads and scales from her body. The eggs hatch in 2-4 days and the larvae skeletonise the tenderest foliage that is to be found. There are four moults at intervals of 24, 36, and 40 hours, and 2½ days.

The larva pupates in the soil near the food-plant, and the adult emerges at the end of 3-16 days.

The predaceous enemies include notably the beetles, *Tetracha carolina* and *Calosoma calidium*, and the wasps, *Polistes canadensis* and *Pelopaeus cementarius*. The most important parasites are *Nemorea leucaniae* and *Sarcophaga georgina*. Birds also feed upon the larvae, especially the quail, field lark, crow, mocking bird and English sparrow.

Two methods of artificial control were found to be effective, mechanical and arsenical. Nearly a hundred experiments were conducted during the year with varying results. From these the following conclusions can be drawn:—a light shallow cultivation with either harrow or sweep, during the pupal period, will turn up from 10-50 per cent. of the pupae; ordinary summer heat at the surface of the ground (120° F.) will kill the pupae in 20-30 minutes; when the larvae assume the army habit of travel, rolling with a heavy roller is ineffective except on hard ground; a heavy log, dragged up and down in a furrow, in the path of the advance is effective; powdered arsenate of lead (1½ lbs. to 50 gals. of water) was effective when applied to plants upon which larvae were feeding; arsenite of zinc (1 lb. to 50 gals. of water) was also effective. When an "ortho" arsenate of lead was used, there was no injury to any of the food-plants. Acid or "meta" arsenates of lead caused burning in some cases, unless lime was added. Arsenical control was obtained in young corn only when the spray solution was forced into the bud. Dusting was not effective, except on plants having a broad lateral leaf surface, as cotton, cowpeas, etc. Poison bait was ineffective in the majority of cases. Early in the season, when the fields were clean of grass and weeds and the larvae spent the day in the soil, coming up at night to feed, poisoned bran-mash killed large numbers, when placed at the base of young corn or cotton plants; moths can be trapped at lights from dusk to 11 p.m., but about 50 per cent. of those captured will have already deposited eggs; while in tropical and sub-tropical latitudes larvae may be found all the year round, there is little doubt but that in the more northern States the species winters as a pupa. Autumn and early winter ploughing therefore, should greatly reduce the numbers of the hibernating pupae.

FORBES (R. H.). **The Gasoline Torch Treatment of Date Palm Scales.**—*Journ. Econ. Entom., Concord*, vi, no. 5, Oct. 1913, pp. 415-416.

Date palms imported from the Old World into Arizona have been generally infested with two scale-insects, *Parlatoria blanchardi* and *Phoenicoccus marlatti*, commonly known as the Parlatoria and Marlatt scales. Parlatoria infests the outer parts of the palms, including leaf-stalks, foliage and fruit. The Marlatt, on the other hand, is found deeply buried between the overlapping bases of leaf-stalks. The writer devised a method of getting rid of Parlatoria by drenching the plants with gasoline and setting fire to them. Since then it has been found that the

use of the gasoline blast torch is much more effective, and controls Parlatoria thoroughly and economically. The Marlatt scale, by reason of its deep-seated location in the date palm is not reached by a treatment which suffices for Parlatoria. By cutting the old leaf stubs down to the bole of the tree and then burning the exposed bole with the gasoline torch, even this scale may be entirely removed. The old Egyptian palms on the Experiment Station Farm near Phoenix, Arizona, thus pruned down to the boles and burned in 1906 are now entirely free from Parlatoria and Marlatt scales. Upon the basis of these observations the following treatment of infested date palms is recommended, and has been adopted by the Arizona Commission of Agriculture and Horticulture:—Destroy *Parlatoria blanchardi* on infested date palms, and their attached suckers by pruning and burning with the gasoline blast torch (described in Bull. 56 of the Arizona Agric. Exp. Stn.). A year after this, if the tree appears to have been successfully treated, as has proved the case with 90 per cent. of those burned in Arizona, the suckers may be cut and transplanted, still infested, however, with Marlatt scale. When the old tree ceases bearing suckers it becomes practicable to clean the bole and burn it more thoroughly to eradicate Marlatt scale, the tree being thus finally freed from both infestations. Transplanted suckers, which at the time of cutting could not have borne the severe burning necessary to deprive them of the Marlatt scale, can be followed up in the same way and finally cleaned.

**Outline of Administration in Controlling Insects and Fungi Injurious to Agricultural Plants in Japan.** *Published by the Bureau of Agriculture, Tokyo*, 1913, pp. 3-32.

This pamphlet gives an outline of the administrative measures adopted by the Japanese Government for controlling disease and insect pests of agricultural plants. A special law has been enacted for checking and preventing the ravages of insects on the farm. The prefects of districts are empowered to issue orders to farmers to take such measures as may appear needful, and Governors are authorised, where necessary, to take measures for the extermination of pests at the expense of the local authorities, the whole of the work being superintended by inspectors sent from headquarters. Subventions may be granted to self-governing corporations to meet the expense of these measures. Details of the law are given, certain sections dealing specially with rice plants. Schedules are provided for reports on the use of trap-lanterns and for each species of insect against which special measures may be directed. Special regulations are laid down with reference to the exportation of rice, fruits and plants, and for the education and instruction of the agricultural population on matters relating to insect pests and plant diseases and the employment of travelling lecturers. A list of insect pests is given, with English, Japanese and scientific names.

*Insects injurious to rice-plants*:—Two-brooded Rice-plant Borer (*Chilo simplex*, Butl.), Three-brooded Rice-plant Borer (*Schoenobius bipunctifer*, Wlk.). Larger Rice-plant Borer

(*Sesamia* (*Nonagria*) *inferens*, Wlk.), Rice-plant Skipper (*Parnara guttata*, Brem.), Rice-plant Leaf-hopper (*Nephotettix apicalis*, Motsch.), White-striped Leaf-hopper (*Delphax furcifera*, Horv.), Brown Leaf-hopper (*Delphax oryzae*, Mots.), Smaller Brown Leaf-hopper (*Delphax striatella*, Fall.).

*Insects injurious to mulberry-trees*:—Mulberry-tree Geometer (*Hemerophila atrolineata*, Butl.), Mulberry-tree Borer (*Apriona rugicollis*, Chev.), Mulberry Scale (*Diaspis pentagona*, Targ.).

*Insects injurious to fruit trees*:—Orange-tree Borer (*Melanauster chinensis*, Forster), Peach-fruit Worm (*Astura punctiferalis*, Guen.), Pear-fruit Worm (*Nephopteryx rubrizonella*, Rag.), Red Orange Scale (*Chrysomphalus aurantii*, Mask.), Yellow Orange Scale (*Aspidiotus aurantii*, var. *citrinus*, Ckll.), San José Scale (*Aspidiotus perniciosus*, Comst.), Long Scale (*Mytilaspis gloveri*, Pack.), Cottony Orange Scale (*Pulvinaria aurantii*, Ckll.), Oyster-shell Scale (*Mytilaspis pomorum*, Bou.), Woolly Aphis (*Eriosoma lanigera*, Hausm.), Grape Phylloxera (*Phylloxera vastatrix*, Plan.), Apple-tree Aphis (*Aphis mali*, F.).

*Insects injurious to vegetables*:—28-spotted Ladybird (*Epilachna 28-punctata*, F.), Bean Aphis (*Aphis rumicis*, L.), Melon Beetle (*Aulacophora femoralis*, Mots.), Turnip-leaf Beetle (*Phaedon incertum*, Baly), Turnip Sawfly (*Athalia spinarum*, Fz.), Radish Aphis (*Aphis brassicae*, L.).

Against *Chilo simplex* (and also *Schoenobius* and *Nonagria*) it is recommended to collect the egg-clusters and capture the moths in the seed-beds about a fortnight before transplanting into the paddy field, and farmers are advised to continue the process even after transplanting. Infested stalks should be cut off close to the ground in the autumn, and if this prove unsuccessful, the stubble and roots should be dug up and burned. Trap-lanterns are recommended, with the water basin suspended about 6 inches above the young plants; in seed-beds there should be 4 or 5 lanterns to every ¼ of an acre. Farmers are recommended to keep the egg-clusters in a proper receptable so as to allow of the hatching out of parasites.

The Rice-plant Skipper should be destroyed as soon as noticed by passing some sort of comb-like apparatus through the leaves or rubbing them with the hand. Wintering larvae on grasses and rushes should be destroyed by burning. The Rice Leaf-hoppers should be captured with an insect net, or oil, at the rate of 6 quarts per acre, should be spread over the surface of the water in the paddy field, the plants being shaken to cause the insects to drop on to the oiled water, which is then drained off and fresh water let in. Petroleum is generally used, but fish or rape oil may answer the purpose. This method is said to be exceedingly effective in the early stages of the insect. For *Hemerophila*, hand-collection of the larvae is suggested. The eggs of *Apriona rugicollis* are laid in recesses in the branches or trunk of the tree. Whenever such holes are detected, petroleum or a similar insecticide should be poured into them by means of an injecting apparatus, or a wire thrust into the holes. It is said that if the trunk or branch be wrapped close to the ground with bamboo sheaths, palm fibre or paper, where possible, oviposition may be largely prevented. The Orange-tree Borer also

lays its eggs in the trunk close to the ground, and the part exposed to attack should be suitably protected with earth or straw, etc.

For scale-insects, kerosene emulsion 1:5 to 1:7 in winter, 1:20 in spring, and 1:15 to 1:20 in summer, may be used; and it is stated that full-grown branches and trunks resist the action of pure kerosene. Against Woolly Aphis fumigation with hydrocyanic acid is recommended for nursery stock, etc. In the orchard, kerosene emulsion 1:10 in winter and 1:15 to 1:20 in spring and summer; a coat of coal tar should be applied to cuts in the wood and to all holes and cracks; and where possible hydrocyanic acid fumigation may be applied. Badly affected trees should be dug out and burnt. The 28-spotted Ladybird is said to be very irregular in its development, eggs, larvae, pupae and adults being found in colonies at the same time on the under surface of the leaves. They should be destroyed by hand or by arsenical sprays. The insect hibernates as an adult in banks, among grasses or underneath stones in sunny places, and should be hunted out and destroyed in the winter months.

Bodkin (G. E.). **Insects injurious to Sugar-Cane in British Guiana, and their natural enemies.**—*Journ. Board of Agric., Br. Guiana*, vii, no. 1, July 1913, pp. 29-32.

This paper contains the following list of 32 species of insects injurious to sugar-cane in British Guiana.

Lepidoptera: (1) *Castnia licus*, F. (Giant Moth Borer); no true parasites known; several species of birds including the 'Old Witch' (*Crotophaga ani*) and 'Kiskadee' (*Pitangus sulphuratus*) prey on the adult. (2) *Diatraea saccharalis*, F., (3) *D. canella*, Hmp., (4) *D. lineolata*, Hmp. (Small Moth Borers); the natural enemies are, egg-parasites: *Trichogramma* sp., and an undetermined species of *Telenomus*; two undetermined species of ants destroy both the parasitised and unparasitised egg-masses; the following Hymenoptera are parasites of the larva: *Iphiaulax* sp., *I. medianus*, Cam., *Cremnops* sp., *C. parvifasciatus*, Cam., *Mesostenoideus* sp.; a large Chalcidid, *Heptasmicra curvilineata*, Cam., has been bred from the pupa, as well as an undetermined Tachinid fly; a fungus parasite (*Cordyceps* sp.) attacks both larval and pupal stages; the larva of an undetermined Elaterid beetle and the Histerid beetle, *Lioderma 4-dentatum*, are predaceous on the larvae and pupae. (5) *Laphygma frugiperda*, S. & A. (Rice Caterpillar); the eggs are infested by a *Trichogramma*; *Henicospilus guyanensis*, Cam., and an undetermined species of Braconid are parasitic on the larva; a Coccinellid beetle (*Megilla maculata*, de G.), a wasp (*Polybia nigriceps*), several species of birds, and a toad (*Bufo marinus*) also destroy the larvae. (6) *Remigia repanda*, F. (Grass Caterpillar); affected by a bacterial disease. (7) *Calymniodes* (*Prodenia*) *latifascia*, Walk. (8) *Lycophotia infecta*, Ochs. (9) *Monodes agrotina*, Guen. (10) *Pamphila* sp. (11) *Philisora catullus*, F.; from the pupa an undetermined species of Chalcidid has been

bred. (12) *Caligo illioneus illioneus*, Cram., an undetermined *Telenomus* attacks the eggs, and a large species of Chalcidid has been bred from the pupa.

COLEOPTERA: (13) *Xyleborus* sp. (Shot-hole Borer). (14) *Dyscinetus bidentatus* (Small Black Hardback). (15) *Cyclocephala signata* (Brown Hardback). (16) *Phileurus bajulus*, F. (17) *Rhyncophorus palmarum*, L. (Palm Weevil). (18) *Metamasius hemipterus*, L. (Weevil Borer). (19) A small brown Chrysomelid Beetle (undetermined).

RHYNCHOTA: (20) *Aspidiotus sacchari*, Ckll. (Sugar-cane Aspidiotus); parasitised by an undetermined Chalcidid. (21) *Pseudococcus calceolariae*, Mask. (Sugar-cane Mealy Bug); attacked by a fungus, *Aspergillus* sp.; two species of Coccinellids (undetermined) prey on the Mealy Bug, and another, *Cryptolaemus montrouzieri*, has also been introduced; a number of species of ants foster the Mealy Bug. (22) *Pseudococcus sacchari*, Ckll. (23) A species of *Pulvinaria*. (24) *Orthezia insignis*, Douglas. (25) *Pseudococcus citri*, Risso. (26) *Tomaspis pubescens* (Froghopper). (27) *Tomaspis* sp. (28) A species of leaf-hopper (undetermined); the eggs are parasitised by a small Hymenopteron.

ISOPTERA: (29 and 30) Termites; two species not yet determined.

ORTHOPTERA: (31) *Conocephaloides maxillosus*, F. (32) *Schistocerca pallens*, Thunb.

PACZOSKI (I. K.). О ГУСЕНИЦАХЪ ПОѢДАЮЩИХЪ ЛИСТЬЯ ПЛОДОВЫХЪ ДЕРЕВЬЕВЪ [On caterpillars devouring leaves of fruit-trees].—*Published by the Zemstvo of Cherson*, 1913. 29 pp.

This is a popular booklet, in which the author draws the attention of fruit-growers to some pests whose caterpillars damage leaves of fruit trees, with special reference to conditions and dates in the Government of Cherson. The following insects are dealt with:—

*Hyponomeuta malinellus*, the caterpillars of which are known by the popular name of "May worms." The moths appear in the Government usually in the second half of June and start pairing and ovipositing after a few days. The mode of placing the eggs, the damage done by the caterpillar and the appearance of the latter, as well as of the imago, are described, and the necessity of fighting the pests either by removing or destroying its eggs or by insecticides is pointed out. *H. variabilis* is also found in the Government, chiefly on plum trees. *Malacosoma neustria*. The rings of eggs of this moth may be noticed on branches of fruit trees after the middle of the summer, but it is not until the next spring that the caterpillars emerge. The latter are described and figured, as well as the damage done by them. The caterpillars start pupating in the first half of June, and the moths emerge at the end of June. Remedies, such as collecting the eggs, hand-picking the caterpillars, and especially spraying, are recommended. *Euproctis chrysorrhoea*. The author

describes the "winter nests" of the caterpillars, the damage done by them in the spring and in the summer, the different stages of the insects and their mode of oviposition. He gives two figures of the nests; before the falling of the leaves and after. The only remedy is the burning of the nests. Although injuring chiefly fruit trees, the nests are found also on various other trees and must be destroyed everywhere. *Lymantria dispar* is similarly described. The caterpillars are sometimes carried by wind over considerable distances; they injure all sorts of deciduous and coniferous trees in the South of Russia, but especially oak and poplar. The remedies recommended are, smearing the egg-masses with a mixture of kerosene (2 parts) and birch tar (1 part), and the use of tangle foot belts. In the last part of the book the author gives some information relating to sprayers, insecticides, &c.

MAASSEN. **Weitere Mitteilungen über die seuchenhaften Brutkrankheiten der Bienen, insbesondere über die Faulbrut.** [Further communications regarding the pestilential brood-sicknesses of bees, especially foul brood.]—*Mitt. aus der Kaiserl. Biolog. Anstalt für Land- und Forstwirtschaft, Berlin*, 8th Ann. Rept., pt. 14, April 1913, pp. 48-58.

In his present researches the author has fed with the bacteria of foul brood, bees which were kept under ordinary conditions of freedom. In no case did sickness result, which proves that foul brood cannot be produced by administering pure cultures of *Streptococcus apis* and *Bacillus alvei*. Then sick or dead larvae were ground up and mixed with honey. Bees fed on this developed sickness in a mild form from which they all had recovered in 2 or 3 months.

The author refers to the fact that the measures he has advocated before have been successful in stamping out the disease wherever they have been adopted. They prove that the destruction of the swarms and of the hives is not absolutely necessary. He reports the appearance in Germany of a new disease, which seems to be already known in England. It is caused by *Aspergillus flavus*. The badly stricken colonies and their combs must be destroyed, preferably by fire. The colonies which are only mildly attacked may be spared, as they may recover; but this should not be relied on, and it is safer to destroy them. All dead bees must also be removed. The hives may be disinfected in the same way as for foul brood.

FEYTAUD (J.). **La destruction naturelle de la Cochylis et de l'Eudémis.** [The destruction of Cochylis and Eudemis in nature.]—*Procès-verbaux de la Soc. Linn de Bordeaux*, lxvii, Mai-Juillet 1913, pp. 90-100.

Cochylis (*Clysia ambiguella*, Hb.) and Eudemis (*Polychrosis botrana*, Schiff.), two of the principal pests of vines, have many natural dangers to combat. Firstly, weather conditions affect

the development of the caterpillars and the emergence of the moth—for example, while warm years, such as 1900, 1906 and 1911, were favourable to *Polychrosis*, cold years, such as 1910, retarded all the stages of development; with *Clysia* the reverse is the case, and within certain limits, it prefers the cold, and suffers in warmer years. Diseases caused by Sporozoa in these insects are not as yet worked out; but those due to entomophytic fungi of the group *Isaria* are well known. In the south of France larvae and pupae of *Clysia* are occasionally found killed by *Botrytis bassiana*, and still more frequently by *Isaria farinosa verticilloides*. Attempts to infest caterpillars and pupae artificially with the spores of this fungus were very successful, especially in a damp atmosphere. Up till the present, work has not been carried out on a large scale, but the successful experiments made in Russia by Metschnikoff and Krassilstchik in combating the *Cleonus* of beetroots with *Isaria destructor*; by Giard, Le Moult, Prillieux, and Delacroise in spreading *Isaria densa* among May bugs; and by Forbes against *Blissus leucopterus* and Trabut against the *Haltica* of the vine by means of *Sporotrichum globuliferum*, all show that the artificial cultivation and injection of such fungi may prove of great economic importance.

Among the most important of predaceous insects are *Coccinella septempunctata*, which eats the young caterpillars; *Malachius*, inoffensive in the perfect condition, but having carnivorous larvae; *Opilo mollis* and *Denops albofasciatus*, whose larvae resemble those of *Malachius* in feeding habits; *Chrysopa vulgaris*, L., *Zicrona coerulea*, L., and *Syrphus hyalinatus*. Amongst parasitic Ichneumonids are numerous *Pimpla* of different species, *Agrypon flaveolatum*, *Phygadeuon*, Hemitelids, and *Omorgus*: these all lay their eggs in the larvae of both moths. The eggs are attacked by *Trichogramma semblidis*, which has about 12 generations in the year, but only about three are in the eggs of the vine moths.

The author suggests various lines of research which would lead to a knowledge of how these natural enemies may be utilised. For example, certain plants encourage the multiplication of these insect enemies, and should be cultivated alongside the vine: the life-history and habits of the different enemies should be studied and taught to agriculturists; the protection of these insects and the possibility of their transportation into new regions also afford subjects for research.

RUSSELL (H. M.). **Observations on the egg-parasites of** *Datana integerrima*, **Walk.**—*Proc. Entom. Soc., Washington*, xv, no. 2, June 1913, pp. 91-97, 4 tables.

The year 1907 was very favourable to *Datana integerrima*, Walk., the black walnut caterpillar, which was extremely abundant on the pecan, and destroyed the foliage extensively. This abundance apparently resulted in a great increase of the egg-parasites of this insect, as the eggs of the last generation in the autumn of 1907 were heavily parasitised. This probably

accounted for the smallness of the first brood in 1908. In the autumn of 1908 the author collected a number of egg-masses of *D. integerrima*, from which he reared four species of parasites, viz., *Trichogramma minutum*, *Baryscapus* sp., *Telenomus sphingis*, Ashm., and *Ooencyrtus* sp. The records of the experiments are given in tables. The first table shows the parasitism of the eggs from September to October. The total number of *Datana* eggs was 10,926; the number of *Datana* larvae hatched was 3,924; the number of parasites was 6,565; leaving a total of 637 eggs unhatched. The second table is a record of the emergence of the parasites, arranged according to date. The third table summarises the results obtained from September to November and shows the numbers of each species of parasite. *Telenomus sphingis* was by far the most common; then came *Ooencyrtus*, *Trichogramma minutum*, and lastly *Baryscapus*. The fourth table gives the records for the spring brood of 1908. This table shows that 45 per cent. of the eggs hatched, 39 per cent. were parasitised, and 14 per cent. failed to hatch.

MORGAN (A. C.). **An Enemy of the Cigarette Beetle.** *Proc. Entom. Soc., Washington*, xv, no. 2, June 1913, pp. 89-90.

In a paper read before the society, the writer describes how he found larvae of a Clerid beetle infesting bundles and boxes of old cigars. The object of the search was to determine the extent of damage done by the cigarette beetle, *Lasioderma serricorne*, F. Experiments very quickly demonstrated that the newly found Clerid larvae, which are bright red and very active, were predaceous upon the larvae and pupae of the *Lasioderma*, and later the adult was found to have the same feeding habits. The adults proved on examination to belong to the species *Thaneroclerus girodi*, Chevr. Its presence in tobacco from Cuba was discovered in France and is referred to by Chevrolat (Bull. Ent. Soc. France, 1880, p. xxxi), who says that it was likely to be predaceous upon the larvae and perfect insects of the genus *Catorama*, the genus to which the species which is now called *Lasioderma serricorne* belongs. *Thaneroclerus* undoubtedly occurs also at Tampa, Florida.

In discussing the paper, Mr. Schwartz mentioned that another enemy of dry Cuban tobacco, viz., *Catorama tabaci*, Guérin, has recently been found.

ASSMUTH (J.). **Wood-destroying White Ants of the Bombay Presidency.**—*Jl. Bombay Nat. Hist. Soc.*, 1913, xxii, no. 2, pp. 372-384, 5 pl.

Seven species of white ants are described, viz., *Leucotermes indicola*, Wasm., *Coptotermes heimi*, Wasm., *C. parvulus*, Holmg., and *Odontotermes feae*, Wasm., which are the most important wood destroyers; *Calotermes (Neotermes) assmuthi*, Holmg., *Microtermes anandi*, Holmg., and *Microcerotermes heimi*, Wasm., which though noxious, are of rarer occurrence

than the first four. The characters of the insects themselves and their methods of attack are described. As regards which woods are more or less termite-proof, the author states that it is impossible as yet to settle definitely, nor is it possible to rely in all cases on advertised "Termicides." He suggests that the only method to pursue at present is co-operation in furthering the study of the biology of these forms, for with a fuller knowledge of their habits and life-history there will be more chance of successfully combating their ravages.

KERSHAW (J. C.). **A New Froghopper from Tobago.**—*Bull. Entom. Research, London*, iv, pt. 2, Sept. 1913, p. 143.

A new species of froghopper, *Tomaspis carmodyi*, is described, found on grass in the island of Tobago, B.W.I.

DISTANT (W. L.). **A Bug attacking *Sesamum indicum*, L.**—*Bull. Entom. Research, London*, iv, pt. 2, Sept. 1913, p. 143.

This is a short note upon *Phricodus hystrix*, Germ., a Pentatomid bug found in South and Central Africa, Madagascar, and Mauritius. It was recently sent to the author from Coimbatore, S. India, with the information that it was found on Gingelly plants. The Gingelly is an oil-plant (*Sesamum indicum*, Linn.) and is distributed all over Tropical Africa, so that the insect will probably be found infesting the plant in Africa as well as in India.

VASSILIEV (EUG. M.). **СПИСОКЪ ЖИВОТНЫХЪ ВРЕДИТЕЛЕЙ ЛЮЦЕРНЫ** [List of pests of Lucerne]. Entom. Exp. St. of the All-Russ. Soc. of Sugar Refiners in Smiela, Govt. of Kiev. —Reprinted from the journal "ХОЗЯЙСТВО," Nos. 16 & 17. 1913. *Kiev*, 1913, 8 pp.

In a book on lucerne by V. V. Mansurov, issued by the Zemstvo of Kiev, there are only mentioned three pests of this plant and the author supplements this statement by a review of all the known pests of lucerne noticed in Europe and in Russia during the last few decades, according to Prof. Kirschner and other authors. As to insects found in South Russia, and particularly in the Government of Kiev, a decision as to whether certain insects are or are not to be regarded as pests is a matter for further observation.

*Root Pests.*—

COLEOPTERA: The larvae of *Melolontha melolontha*, L., *M. hippocastani*, F., *Rhizotrogus solstitialis*, L., and ELATERIDAE: *Hylastinus obscurus*, Marsh.

DIPLOPODA: *Julus londiniensis*, Leach, *J. unilineatus*, Koch.

NEMATODA: *Heterodera radicola*, Greeff, also damages melons: *H. schachtii*, A. Schmidt.

*Pests injuring Leaves and Stalks.*—

COLEOPTERA: *Lethrus apterus*, Laxm., *Sibinia* sp., *Hypera murina*, F., *H. meles*, F., *H. variabilis*, Hbst., *H. adspersa*, F., *Otiorrhynchus ligustici*, L., *Sitones lineatus*, L., *S. lineellus*, Bonsd., *S. sulcifrons*, Thb., *S. griseus*, F., *S. tibialis*, Hbst., *Barynotus obscurus*, F., *Derocrepis rufipes*, L., *Phytodecta fornicata*, Brüggm., *Colaspidema atrum*, Oliv., *Longitarsus pratensis*, Pz., var. *medicaginis*, All., *Subcoccinella 24-punctata*, L., and *Thea 22-punctata*, L. (feeds on mycelium of fungi and is not likely to cause any serious damage).

LEPIDOPTERA: *Lithocolletis nigrescentella*, Logan, *L. insignitella*, Z., *Coleophora medicaginis*, H.S., *Epithectis nigricostella*, Dup., *Anacampsis biguttella*, H.S., *Phasiane clathrata*, L., *Biston graecarius*, Stgr., *Euclidia mi*, Cl., *E. glyphica*, L., *Lasiocampa trifolii*, Esp., *Macrothylacia rubi*, L., *Dasychira fascelina*, L., *Plusia gamma*, L., *Chloridea dipsacea*, L., *Pieris napi*, L., *Colias hyale*, L., *C. edusa*, F., *Lampides baeticus*, L., *Lycaena argiades*, Pall., *L. argyrognomon*, Brgst., *L. icarus*, Rott., *L. dolus*, Hb., *L. cyllarus*, Rott.

RHYNCHOTA: *Aphis medicaginis*, Koch, *Macrosiphum pisi*, Kalt., *Myzocallis ononidis*, Kalt.

DIPTERA: *Perrisia ignorata*, Wachtl, *P. lupulinae*, Kieff., *Asphondylia* sp., *Agromyza nigripes*, Mg., *Phytomyza affinis*, Fall., *Anthomyia funesta*, Kühn.

ACARI: *Tetranychus telarius*, L., *Eriophyes plicator*, Nal.

NEMATODA: *Tylenchus devastatrix*, Kühn.

*Pests injuring the Flowers and Seeds.*—

COLEOPTERA: *Epicometis hirtella*, L. (*Tropinota hirta*, Poda), *Apion pisi*, F.

LEPIDOPTERA: *Phlyctaenodes sticticalis*, L., *Lycaena icarus*, Rott.

RHYNCHOTA: *Adelphocoris lineolatus*, Goeze, one of the most serious pests of lucerne in Kiev.

DIPTERA: *Contarinia medicaginis*, Kieff., *Asphondylia miki*, Wachtl.

ACARI: *Eriophyes plicator*, Nal.

CLARKE (John M.). **Twenty-eighth Report of the State Entomologist, 1912.**—*New York State Museum*, Bulletin no. 165, 15th July 1913, pp. 264, 79 figs., 14 pls.

Nineteen pages of this report are devoted to the Codling Moth (*Cydia pomonella*, L.), the damage done by it and methods of prevention, with tables showing the results of the various operations conducted. The Hessian Fly (*Mayetiola destructor*, Say) is dealt with also at a considerable length and the following parasites are enumerated, some of which are so active that it is said that 70 per cent. of the pupae found in a representative sample of infected wheat were infested and less than 12 per cent. were in a condition to produce flies. The most abundant parasites

were *Merisus destructor*, Say, and *Tetrastichus carinatus*, Forbes; and one specimen of *Eupelmus allyni*, French, one of *Callimome*, one of *Pleurotropis* and a Pteromalid were obtained. In addition to these a wingless species *Homoporus subapterus*, Riley, is reported as being very efficient in Missouri, and *Platygaster herricki*, Pack., and *Entedon epigonus*, Walk., should be of assistance in checking this pest. *Pteromalus pallipes*, Forbes, is another species which preys upon the Hessian fly.

The remedial measures consist in late sowing, good culture, the use of trap strips, the burning of stubble and chaff or ploughing them under, the destruction of all volunteer wheat, and proper rotation of crops. Reference is made to bibliographies in the report of the Entomologist for 1901 (New York State Museum, Bulletin 53, pp. 705-730) and to a list of more recent literature by Hayhurst in the Jl. Econ. Entom., 1909, 2, pp. 231-34.

The Fall Army Worm (*Laphygma frugiperda*, S. & A.) has attracted attention in consequence of the injury done to lawns. A bibliography from 1797 to 1912 is given.

The Elm-leaf Beetle (*Galerucella luteola*, Müll.) did great damage in certain districts, but on the whole not so severe as in the exceptional season of 1911. Methods and results of spraying are given. Various species of *Lachnosterna* recorded in New York State are illustrated with remarks on their life-history and the damage done. A common parasite of these beetles in Illinois is *Tiphia inornata*, Say; also *Myzine sexcincta*, F., and *Ophion bifoveolatum*, Brullé; *Sparnopolius fulvus*, Wied., and *Pyrgota undata*, Wied., have been reared from larvae in Illinois, but these species are unfortunately not common in New York State. The destructive work of the Hickory Bark Borer (*Eccoptogaster quadrispinosa*, Say) in the Hudson Valley, which began some three years ago, has been continued in the past season. The effect of various remedies is discussed and the opinion is expressed that these borers attack trees which, for some reason or another, are not in good health. It is advised that whenever the attack is serious all infested trees or parts of trees should be cut out and the bark destroyed before the following June. Firewood with the bark on should all be burnt during the winter, otherwise the bark should be stripped.

Pear Thrips (*Euthrips pyri*, Daniel) is understood to be widely distributed in the Hudson Valley; it is a local pest with a curiously restricted range, sometimes attacking one portion of an orchard only. The insect was first discovered in California and has been recorded from a number of localities in the Hudson Valley and at Geneva. It appears to affect principally trees growing on healthy soil where early and thorough cultivation is either difficult or impossible. Certain orchards on light sandy soil at Kinderhook for example are free from the pest. This may be a coincidence, but as the insect winters in the soil and in one particular instance did serious damage to certain orchards which were not cultivated till late, it is suggested that early and thorough cultivation may prove a good remedy.

Klingner. **Kann Reblaub aus Weinbergen, die zum zwecke der Heu- und Sauerwurm-Bekämpfung mit Nikotinseifenbruhe bespritzt wurden, verfuttert werden?** [Can vine leaves, which have been sprayed with nicotin soap spray to combat the vine moths, be used for fodder?] — *Weinbau der Rheinpfalz: Neustadt a. d. Hdt.*, i, no. 16, 5th August 1913, p. 176.

In view of the susceptibility of animals to nicotin poisoning the author has examined this question. Premising that no data from practical experience are at present to be had, he nevertheless bases an affirmative reply on the following grounds: (1) The spray in use contains 100 parts by weight of water, 1 part soap jelly and 1½ parts tobacco extract. The percentage of soap is quite harmless. The tobacco extract used usually contains 10 per cent. nicotin which is its only poisonous component. Thus 10,000 parts of spray contain 15 parts of nicotin, which is mostly free and therefore evaporates in a few days. What remains is not poisonous. Any taste still present is due to the residues. (2) As the spray is chiefly directed on the flowers and on the grapes very little of it reaches other parts. (3) Even the grapes which have been heavily sprayed may be eaten without danger, as each vine only receives a small quantity of spray in which the nicotin averages about ·187 milligram.

The author was confirmed in this opinion by the veterinary surgeon of the district. Care must be taken to mix the spray thoroughly and in proper proportions.

**Der Apfelwickler** (*Carpocapsa pomonella*, L.) **und seine Bekämpfung.** [*Cydia (Carpocapsa) pomonella* and its repression.] *Kgl. Lehr- und Versuchsanstalt für Wein- und Obstbau in Neustadt a. d. Haardt.* *Weinbau der Rheinpfalz, Neustadt a. Hdt.*, i, no. 15, 23rd July 1913, pp. 170-171.

Latterly complaints of damage done by *C. pomonella* in the Rhine Province have increased. The provision is recommended of artificial places in which the larvae can winter or pupate. Tree bands are useful. Those commercially obtainable are of corrugated millboard; they are fixed round the trunk, tightly tied at the upper edge and loose at the lower one, so that the caterpillars can find shelter. Even better is a 6-inch belt of woodwool protected against rain by parchment paper. In the Rheinpfalz caterpillars should be collected at the end of September, if there is only one generation a year. If two, then about the middle of July, when the trap must be refixed.

Fallen fruit should be collected as soon as possible after they drop, in order to destroy the caterpillars before they leave. The trees must be strongly shaken to make worm-eaten fruit fall. The trees should be cleaned in the usual manner in winter, and the store-room windows must be closed during the season of flight. If all these measures are adopted by all the fruit-growers in a district, they will often prove successful.

SCHWANGART (Dr.). **Weinbau und Vogelschutz.** [Vine-growing and Bird Protection.]—*Weinbau der Rheinpfalz, Neustadt a. d. Hdt.*, i, nos. 15, 16, 23rd July and 5th Aug. 1913, pp. 166-169, 179-181.

In the course of his address to the 2nd German Bird Protection Congress, held at Stuttgart from 12th to 14th May, Dr. Schwangart vouched for the usefulness of the swallow in vineyards, where they catch the vine moths. Bats are equally useful in the twilight and at night. He holds that the useful insects suffer little from insect-eating birds, and strongly advocates bird protection, with due consideration for the conditions under which vine-growing is carried on.

MARTELL (P.). **Insektenfeinde der Bücher.** [The insect enemies of books.] *Entom. Zeits., Frankfurt a/M*, xxvii, nos. 25 and 26, 20th and 27th Sept. 1913, pp. 142-143 and 147-149.

This review of the various book-pests contains a note on the usefulness of the scorpion tick (*Chelifer cancroides*) in combating the book-louse. The author points out the excellence of carbon bisulphide for fumigation purposes. The method is simple; a saucer containing the chemical is placed with the books in an iron box, 2 oz. being sufficient for a space of 60 cubic feet, and in 24 hours the destruction of eggs, larvae and insects is complete. Pouring in the chemical and the subsequent opening of the box must be done by daylight, as carbon bisulphide when mixed with air produces an explosive compound. With proper care there is no danger. The box is best kept in a well-ventilated room.

PACZOSKI (I. K.). **НАСѢКОМЫЯ, ПОВРЕЖДАЮЩІЯ КУКУРУЗУ** [Insects injurious to Maize].—*Published by the Zemstvo of Cherson*, 1913, 14 pp., 5 figs.

This is a popular pamphlet issued by the Zemstvo, containing useful information as to some pests of maize, the cultivation of which is increasing rapidly in the Government and is of great importance.

The author deals first with *Pyrausta nubilalis*, Hb. (*Botys silacealis*, Hb.), describing and figuring the larva and moth. The hibernating caterpillars pass the winter in the lowest parts of the stalks of maize, as well as of millet and of hemp (they injure also sunflowers and hops); they pupate at the end of spring, usually in May, the moths issuing three weeks afterwards, not before June. The females oviposit on maize, the caterpillars appearing a fortnight later and feeding for some time on the outside of the plants; they afterwards penetrate into the stem. The author doubts whether this insect has two generations in the government, as assumed by some other observers. The best remedy is suggested by the mode of wintering of the insects: the maize stubble ought to be removed and burned, and the millet stubble ought to be ploughed in deeply, immediately after the

harvest. This removal of maize stubble can be done in the autumn; or, if it is desired to retain the stubble in the fields to arrest and keep the snow, so as to ensure the moistening of the soil, it can be removed in spring, as the larvae pupate late. As some larvae remain on the upper parts of the plants which are taken home after the harvest, the latter must be disposed of, either as food or as fuel, not later than in May, so as to prevent the further development of the caterpillars.

The sown grains of maize are damaged in the spring by the larvae of *Agriotes lineatus*, L., and related beetles of the family ELATERIDAE. In the southern parts of the Government the Elaterid beetle, *Athous niger*, L., appears, living usually on unploughed ground or on old pasture freshly ploughed, but avoiding ploughed land, so that they do damage on newly broken ground only for a year or two. *A. lineatus* is found in the northern parts of the Government and its larvae cause considerable injury to seed maize soon after it is sown. The author is not satisfied that trap-sowings of poisoned maize, some time before the actual sowing, are of any use, as the larvae do not appear to touch poisoned seed. The remedy suggested consists in the late sowing of maize, when the higher temperature assists the rapid growth of the plants; the seeds ought also to be put into water before sowing, so that they may grow more quickly. The insects injure only the seed and are not dangerous to grown plants. It is also recommended to replough the fields in June, immediately after the harvest, when the larvae start pupating.

The last pest mentioned in the pamphlet *Pentodon monodon*, F. gnaws through the part of the stem beneath the soil. Its activity begins early in June and continues till the middle of August, when, having oviposited in the soil the insects perish. Hand-picking is recommended as a remedy, also trenches round the field, in which the insects can be collected.

PACZOSKI (I. K.). ОЛЕНКА МОХНАТАЯ И БОРЬБА СЪ НЕЮ [*Epicometis hirtella*, L., and the fight against it]. *Published by the Zemstvo of Cherson. Third, enlarged edition. Cherson*, 1913, 22 pp.

*Epicometis hirtella*, L. (*hirta*, Poda) has only lately attracted the attention of fruit-growers, owing to the ever-increasing amount of damage done by it and the author points out that this is due to the increased ploughing up of virgin land and the destruction in this way of the wild plants, which have previously served as food for the insects. The species is found in southern and middle Europe, but is noticeably injurious only in South Russia, Hungary and in parts of Italy. In the Government of Cherson the insects emerge from the earth, where they hibernate in the imago stage, earlier or later in April. In warm, calm weather they invade orchards in swarms and devour the ovaries of fruit blossoms; sometimes the whole harvest in an orchard is thus destroyed in 2 to 3 days; in rainy, gloomy or windy weather they either remain in the earth, where they usually pass the night, or do not wander in search of food, but devour the plants on

the spot, sometimes eating even the leaves of low trees. Besides blossoms of fruit trees they feed also on all wild plants, except grasses, sedges and some others, while among cultivated plants they attack also the vine, rye and rape. In Cherson they start attacking rye in the first half of June, after the blossoming of fruit trees is over and they forcibly extract the ears from their sheath.

The females oviposit in earth at a depth of 1½-2 inches, selecting soft soil, rich with decaying matter. According to J. F. Schreiner, they oviposit preferably in the small heaps of earth formed by mice in the fields, where the latter hide ears and stems of grasses, which, decaying in the spring, provide food for the young larvae. A week after the oviposition the larvae issue; they resemble those of *Anisoplia austriaca*, differing from the latter by the way they move, without using their legs, on their sides or backs. At the end of July and in the first half of August the larvae pupate, producing the imago in about 15 days. The latter however does not emerge from the cocoon, but remains inside over the winter, not appearing till the next spring.

Coming to the question of remedies, the author first deals with some of those usually applied or recommended, which, according to him, are of no use, such as: spraying, which has not given any practically valuable results; fumigating; beekeeping—some authors declared that *E. hirtella* avoids gardens where bees are present, which however is wrong; and the cultivation of tall trees, which remedy cannot be any protection against the insects.

The author recommends the following remedies:—(1) ploughing of the fields on which oviposition by the insects has been noticed. If the fields are under crops, the ploughing must be done immediately after the harvest is completed. Before ploughing the depth at which the eggs or larvae are found ought to be ascertained; the latter depends on the wetness of the soil, and the ploughing must be done accordingly, and the land harrowed the next day. The best results would be obtained by applying this remedy early in June. Ploughing after the harvest may also be useful against various other insects. (2) To preserve, so far as possible, wild plants on steppes and similar places, thus keeping the insects away from the orchards. (3) To plant wild steppe cherry or thorn bushes round orchards, taking care however to destroy various other insects which may breed on them, and at the same time collecting the *Epicometis*. According to Plodovsky, rhubarb (?) is very suitable for this purpose, as it is attractive to insects and blossoms at the same time as many fruit-trees, and remains in bloom for a long time. (4) The more valuable sorts of plants ought to be protected by gauze round their crowns. This is specially recommended by Mokrzecki and is done in the Government of Taurida; the cost is about 2*s*. 6*d*. for a tree of medium size. (5) Birds destroying the insects ought to be protected. (6) Hand-picking. Some time ago the Zemstvo of the Government paid a premium for hand-picking. Lately this has been discontinued, but taken up by some of the District Zemstvos. The premium paid varies from 2½*d*. to 5*d*. per

1½ litres. The author urges the necessity for applying this remedy, as one by means of which the number of the insects may be materially decreased; which, according to him, is all that is wanted. These insects are injurious only when in great numbers, otherwise playing a useful part in diminishing the excessive quantity of fruit which may otherwise be found on trees, but which could not all develop. Before collection, spraying with water is useful, as it makes the insects sluggish and sometimes causes them to drop to earth; the spray must be very fine. (7) The author suggests trying the remedy recommended by Schreiner which consists in catching the beetles on sheets of blue paper, smeared over with sticky matter; evidently the blue colour attracts the insects. The sticky matter according to Kintzel, a gardener in the Government of Astrachan, who drew the attention of Schreiner to this remedy and obtained excellent results, is prepared by heating slightly 7 parts of pine pitch and adding to them 3 parts of linseed oil and 1 part of vaseline. This is slightly boiled and smeared on the sheets of paper. The latter are put in the orchards amongst the trees, in sunny spots.

CARPENTER (G. H.). **The Life-History of Insects.**—*Camb. Manuals of Science & Literature, Camb. Univ. Press*, 1913, 134 pp., 1 pl., 23 figs.

This volume is an outline sketch of the facts and meaning of insect metamorphoses, dealing with growth and corresponding changes in form, larvae and their adaptations, pupae and their modifications; the life-history of certain sucking insects is dealt with in some detail, including the Aphids and the Mussel Scale-insect (*Mytilaspis pomorum*). There is a chapter on the palaeontology of insects and its significance. A bibliography is given.

BARBEY (A.). **Traité d'Entomologie Forestière.**—*Paris & Nancy*, 1913, 617 pp., 350 figs., 8 pls.

This is a comprehensive and very useful manual of Forest Entomology. An introductory chapter deals with the occurrence in general of insects in forests, with brief references to the kinds of damage they may do. The second chapter is a purely zoological one, dealing with the anatomy of insects, and includes a broad classification. The greater part of the book is subdivided under the names of the principal forest trees, and an account is given of the insects which attack each tree, with the methods of combating them. There is a short chapter on useful insects, and a comprehensive bibliography.

McCOLLOCH (J. W.). **A Parasite of the Chinch Bug Egg.**—*Science, New York*, xxxviii, p. 976, 12th Sept. 1913, pp. 367-368.

In experiments conducted this year to determine the time of the first appearance of young chinch bugs, and the mortality of the eggs, it was discovered that a large number of the eggs

examined were parasitised. The life-history of the parasite was worked out for four generations until 5th July. From 5th–23rd July only an occasional parasitised egg was found in the field, but from then onwards they were obtained in large numbers. Up to the time of writing, over 325 individual parasites had been bred. The length of the life-cycle was found to vary from 10–18 days, depending on the climatic conditions. The parasite was found in every wheat and cornfield examined round Manhattan. Of 3,101 eggs collected between 28th April and 10th June the percentage parasitised was 20·8, and of 116 eggs collected at Crawford (Central Kansas) the percentage was 16·3. The parasite has also been taken at Dodge City (S.W. Kansas). The work is proceeding and a description of the parasite and its life-history and efficiency will be published later. Regarding the systematic position of the insect, it is found that the species will require a new genus; it is probably a member of the family PROCTOTRYPIDAE, and is related to the genus *Telenomus*.

SACHAROV (N. L.). ОТЧЕТЪ О ДѢЯТЕЛЬНОСТИ ЭНТОМОЛОГИЧЕСКОЙ СТАНЦІИ ЗА 1912 ГОДЪ [Report of the Entom. Sta. of the Astrachan Soc. of Fruit-growing, Gardening, Market-gardening, and Field-cultivation].—*Astrachan*, 1913, 25 pp.

In a short preface to his report the author gives the history of the Station, which was founded in 1911 and is supported by contributions from the Department of Agriculture, the Zemstvo and the local Horticultural Society.

Chief among the pests of the year under report must be placed *Phlyctaenodes sticticalis*, L., which hatched in such enormous quantities, that the steppes in three districts (Zarev, Enotaev and Krasnojar) were literally covered by the caterpillars; they destroyed the whole of the weeds and wormwood plants on the steppes, and then migrated in masses, playing havoc with crops, orchards and market-gardens. During their migrations the insects filled the streets of the villages and even penetrated into the houses, the population being helpless against them. The invasion of the area of cultivated plants began on the 17th July and continued till the 26th, when the caterpillars started passing into the earth to pupate. The first generation appeared at the beginning of May, and it was these caterpillars which were responsible for the enormous damage. The pupal stage lasted about 11 days (from the 25th July to the 5th August); the moths of the second generation began to oviposit on the 6th August, the caterpillars appeared on the 11th August and began pupating on the 1st September, and several days after the third generation appeared. About 20 per cent. of the caterpillars of the first generation and about 28 per cent. of those of the second hibernated in the pupal stage. The caterpillars fed on all weeds and cultivated plants except *Euphorbia* among the former and tomatoes and *Solanum nigrum*, L., among the latter. About 35 per cent. of the larvae of the first generation were infected by parasites, among which were noticed:—

Braconidae: *Microtypus sacharovi*, Kok. sp.n., found only in South Russia and Transcaspia; *Agathis longicauda*, Kok.; *Apanteles ruficrus*, Hal., a parasite of the caterpillars of the third generation; *Apanteles* sp. Ichneumonidae: *Omorgus lugubrinus*, Holm., *Angitia chrysosticta*, Gmel., *Labrorychus debilis*, Wesm., var. n. *phlyctaenodis*, Kok., *Cremastus* [illegible], Sz., and *Mesochorus* sp.

Except *Apanteles*, which parasitises the larvae, and the *Mesochorus*, which is a hyperparasite of Tachinids, all the other species emerged from the pupae. Two Tachinids also attacked the larvae, *Tritochaeta polleniella*, Rond., and *Nemorilla maculosa*, Mg.

Another serious pest of the melon-fields is *Euxoa segetum*, Schiff., which appeared at the end of May and injured not only melons but also other vegetables; neither summer- nor winter-sown grain crops suffered from this pest. The author is of opinion that *E. segetum* has there two generations.

A list is given of all the saltatorial Orthoptera observed in the Government during 1912, amounting to 37 species, of which the most injurious are, *Locusta (Pachytylus) migratoria*, L., and *L. danica*, L., both of which are found in the south, the latter forming 10-15 per cent. of their numbers. In the steppes are found *Caloptenus italicus*, L., *Oedipoda coerulescens*, L., and *Oedaleus nigrofasciatus*, de G. The Asiatic locusts breed on the banks of the arms of the Volga and on the coasts and islands of the Caspian Sea, in places which are covered with reeds. The hatching of the locusts in the lower parts of the Volga occurs between the 18th and 28th May; the whole development requires about 42 days (23rd May to 5th July), and oviposition proceeds throughout September.

The following parasites were obtained:—From 1 to 3 larvae of *Sarcophaga lineata* were found in the thoracic cavities of full-grown nymphs of locusts; while 5 to 7 larvae of a fly of the genus *Anthomyia* were found in the thorax of some adult locusts. The following Meloid beetles were obtained from the egg-masses of Asiatic locusts and *Caloptenus italicus*: *Zonabris 4-punctata*, *Z. variabilis*, *Z. impar*, *Z. 14-punctata*, *Z. floralis*, *Z. dejeani*, *Z. 10-punctata*, *Z. zebrae*, *Z. crocata*, *Z. calida* and *Epicauta erythrocephala*. The eggs were also parasitised by the larvae of a Bombyliid fly, *Systoechus* sp., and in some cases a fungus disease, *Empusa grylli*, was found on them.

*Caloptenus italicus* has done considerable damage to fruit trees in some parts by eating the leaves; another species damaged young apples by gnawing them. This year the experiment of fighting locusts by chemical remedies was tried for the first time and gave excellent results.

Although fruit-growing is almost the chief occupation of the population in the Government, the orchards are in a very neglected state, so far as various pests and fungus diseases are concerned, and one or the other of the pests appears yearly in enormous numbers and sometimes reduces the harvest to nothing. It is very difficult to persuade the Tartars to apply remedies, religious objections being raised, but even the Russian growers

only slowly realise the importance and necessity of protecting their orchards. The following pests are mentioned:—

On vines: *Polychrosis botrana*, Schiff.: only hand-picking is applied and, on very rare occasions, spraying. On apples: *Cydia (Carpocapsa) pomonella* was found after the 7th June; the author reports a new form of injury to the ends of the fruit-branches; *Hyponomeuta malinellus*, *Euproctis chrysorrhoea*, *Epicometis hirtella*, *Tmetocera ocellana*, *Anthonomus pomorum* and *Ornix anguliferella*. On pears: *C. pomonella*, *Psylla pyricola* and *Tingis pyri*. On cherries: *Rhynchites auratus* and *Eccoptogaster rugulosus*: the larvae of the latter were infected by *Chiropachis colon*, L., *Ecphylus hylesini*, Ratz., and some other unidentified parasites; cherries were also damaged by *Selandria (Eriocampa) adumbrata*, Klug. On quinces: *Euproctis chrysorrhoea* and to a certain degree *C. pomonella*. On plums and apricots: *Eurytoma schreineri* and *Lecanium* sp.

The condition of the market-gardens in the Government is better than that of the orchards and they suffer less from insects. *Laphygma exigua*, although very injurious in 1911, was not noticed in 1912; the most serious pest is *Gryllotalpa vulgaris*. Cabbages were damaged by *Colaphus sophiae* and by *Strachia ornata*. Radishes and turnips were injured by *Evergestis extimalis*, Scop., the biology of which is quite unknown.

SACHAROV (N.). О ВРЕДИТЕЛЯХЪ ГОРЧИЦЫ [On the pests of Mustard].—*Published by* АСТРАХАНСКОЕ ОБЩЕСТВО САДОВОДСТВА, ОГОРОДНИЧЕСТВА И ПОЛЕВОДСТВА [Astrachan Horticultural, Market-gardeners' and Agricultural Society], 1913, 5 pp., 1 pl.

The cultivation of mustard is a very profitable one in the Government of Astrachan owing to its ability to withstand dry weather and its adaptibility to any soil; about 48,600 acres of mustard are cultivated there, being 3·9 per cent. of the total soil under cultivation. It does not require any special care after it has been sown, except for the attacks of injurious insects, which sometimes destroy the whole crop, and the author has therefore paid special attention to them.

*Phyllotreta atra*, F., is the principal pest, having several broods, but the first one is chiefly responsible for the damage done to the sprouting mustard, which is sometimes so great that the crop has to be resown. When the plants have established themselves the injury done is less significant. The beetles emerge when there are no weed Cruciferae on which they can feed, and they therefore concentrate on the sprouting mustard.

*Athalia spinarum*, F., passes through several generations during the summer, and breeds on mustard, as well as on wild Cruciferae. The eggs are deposited singly on the lower side of the leaves, each female being able to lay up to 300 eggs. The insect, egg and larva are described. Having reached its normal size the larva leaves the plants and pupates in the earth at a depth of about 1-1½ inches, wintering in the larval stage in its cocoon.

*Colaspidema sophiae*, Schall., has not been previously recorded as injurious, but last year's observations have shown that it does, both as a beetle and larva, enormous damage to mustard, as well as to cabbage and turnips. The imago and larva are described. The larvae usually live in company with those of *Athalia spinarum*. *Pieris daplidice*, L., is also a mustard-feeder. The caterpillars are attacked by many parasites, which destroyed last year up to 80 per cent. of caterpillars and pupae. Amongst the parasites are mentioned:—*Anilasta ebenina*, which kills the caterpillars in the third or fourth stage and pupates inside their skins; the author obtained three species of small hyperparasites of this parasite. *Pteromalus puparum* parasitises the pupae; *Chalcis flavipes*, which has not been previously noted as a parasite of this insect, was responsible last year for the destruction of about 50 per cent. of the pupae of *P. daplidice*; it also parasitises *P. rapae*.

The caterpillars of *Plutella maculipennis*, Curt., devour the young sprouts and pods and damage the leaves of mustard. It has many small parasites, not yet identified; and there are several generations during the summer.

*Lixus ascanii*, L., v. *albomarginatum*, Boh. Having described the larva, pupa and imago, the author deals with the injuries caused by this insect. The eggs are laid on the collar of the plants; the larvae passing inside, eat the core for some time, after which they descend into the roots, hollowing them out and leaving only the walls; pupation takes place in the root. Besides the above insects, mustard has also been damaged by species of *Mylabris* (*Zonabris*), the larvae of which devour the eggs of Italian locusts. These beetles eat away the tender parts of the plant, but in the opinion of the author, the harm done by them is minimal in comparison with their useful activity in destroying locusts; any remedy against them would lead to a multiplication of locusts, which would devour the whole of the mustard.

As to remedies, the author hesitates to recommend any owing to the inadequacy of his observations; spraying with Paris green or other arsenical preparations may prove useful, but he is unable to give formal recipes.

SACHAROV (N). КАПУСТНЫЙ ЛИСТОѢДЪ И КАПУСТНАЯ ОГНЕВКА [*Phaedon cochleariae* var. *neglectus*, Sahlb., and *Pionea forficalis*, L.]—*Reprint from the journal* "САДЪ И ОГОРОДЪ" [*The Orchard and Market-Garden*]. *Moscow*, 1913, 7 pp.

Both these insects injure cabbages, turnips and other Cruciferae. *Phaedon* is a beetle of the family CHRYSOMELIDAE, and the author describes the imago, egg, larva, cocoon and pupa. The beetles do not jump when the leaves are touched, but drop to the earth, simulating death. The females eat a trough in the parenchyma of the leaves, on the lower side, the size of the trough

being equal to that of the egg; in such a trough one egg (rarely two) is deposited. The development of the egg takes 9-10 days; on leaves more exposed to the sun it proceeds more quickly. The larvae are very slow in their movements during the first portion of their life; they move on gradually, eating away the parenchyma and fouling the leaves with their excrement. The larval stage lasts 13-17 days, there being two moults during this time; 5-6 days after the second moult they pass into the earth, to a depth of 5-6 mm., where they form cocoons and pupate. The larvae are able to eject a liquid which serves them as protection against their enemies. The pupal stage lasts 12 days. The total number of eggs deposited by one female is 65-70. The insects winter as adults or as pupae. Early in spring the hibernated beetles feed on weed Cruciferae, passing on to cultivated market-garden plants as soon as they appear. Spraying with Paris green (about 1 oz. of green, and about 2 oz. of lime in 2·7 gallons of water) is recommended; a tablespoon of green soap or two spoons of flour paste ought to be added to the solution to make it more adhesive. This insecticide kills the imago in 2-3 days, the larvae perishing even before. If the pests have concentrated on single plants, the latter cannot be saved and ought to be removed and destroyed, taking care not to shake down the larvae; sometimes they attack only single leaves of plants, when the same must be done to these leaves.

As to *Pionea forficalis*, the author did not find these pests in the south of the Government of Moscow. He describes all the stages in the life of the insect. The eggs are laid in heaps of 15-25, the total number laid by one female in the laboratory being about 80. In the Government of Tver the insects are double-brooded. The wintering caterpillars pupate in the latter half of May, the imago appearing during the first half of June. They oviposit on cabbage, turnips, etc. The caterpillars of this generation pupate in the first half of July. In July and August the caterpillars of the second generation may already be noticed. These caterpillars are not able to produce an imago that year and pass into the earth where they winter in cocoons. Spraying with Paris green is also the best remedy for this insect.

POSPIELOV (V. P.). ОТЧЕТЪ О ДѢЯТЕЛЬНОСТИ ЭНТОМОЛОГИЧЕСКОЙ СТАНЦІИ ПРИ ЮЖНО РУССКОМЪ ОБЩЕСТВѢ ПООЩРЕНІЯ ЗЕМЛЕДѢЛІЯ И СЕЛЬСКОЙ ПРОМЫШЛЕННОСТИ ЗА 1912 [Report of the Entomological Station of the South-Russian Society for Promoting Agriculture for 1912].—*Reprint from the journal* "ХОЗЯЙСТВО." *Kiev*, 1913. 22 pp.

The author reports the results of experiments on the effect of carbon bisulphide ($CS_2$) against *Melolontha*, *Anomala aenea* and related species. A table illustrating these results is given and it appears that a dose of 5-7 grams of the insecticide injected into the soil to a depth of about 7-9 inches kills all the larvae round a root over a space of about 2½ inches from the point of injection.

Smaller doses injected not so deep or at a greater distance gave unfavourable results. It was further proved that 35-40 grams of carbon bisulphide injected to the same depth are sufficient to kill all the larvae in a space of about 5½ square feet. The Department of Agriculture requested the Station to examine the effect of carbon tetrachloride ($CCl_4$) owing to the inflammability of carbon bisulphide; but it appeared that this second remedy is much less effective than the previous one.

The author also gives an account of a conference of representatives of some Russian Railways and of the Committee of the Riga Exchange on means of preventing the spread of *Calandra granariae* in stored grain.

The remainder of the report is a series of small reports on the work of the author, the Director of the Station, and his assistants.

*Coeliodes fuliginosus*, Marsh., damaged some 135 acres of poppy in Podolia; the removal and destruction of the injured plants as well as reploughing in the autumn were recommended.

*Cassida nebulosa*, L., and *C. nobilis*, L., damaged beets in Charkov, the latter species appearing in smaller numbers; *Barathra brassicae*, L., occurred on peas in Poltava in July, and *Xylina exoleta*, L., on beets in Charkov.

*Eriophyes pyri*, Pagenst., were found on leaves of pear trees near Kiev; *Epicometis hirtella*, L., damaged blossoms of quinces in the district of Mohilev, in Podolia; the bark of apple trees mined by the caterpillars of *Sesia myopiformis*, Birkh., was sent from Volhynia; *Simaethis pariana*, Clerck, (*Choreutis parialis*) injured apple trees in the Government of Kiev; *Pammene rediella*, Clerck, occurred in unripe apples in a garden near Kiev.

*Hylastes ater*, Payk., has damaged pine seedlings in the Shershnev forest in Kiev. The larvae of *Lophyrus rufus*, Klug, damaged, in May, some 135 acres of pine plantations in the Zvenigorodsk forest in Kiev; hand-picking was adopted. Three species of Microlepidoptera, *Evetria (Retinia) buoliana*, Tr.; *Evetria (Retinia) duplana*, Hb., and *Dioryctria splendidella* have damaged the buds and shoots of young pines in Kiev.

Pospielov (V.). ОПЫТЫ ИСКУССТВЕННАГО ЗАРАЖЕНІЯ ОЗИМОЙ СОВКИ ЕЯ ПАРАЗИТАМИ-НАѢЗДНИКАМИ ВЪ КІЕВСКОЙ ГУБ. [Experiments on the artificial infection of *Euxoa segetum*, Schiff., by its parasites in the Government of Kiev].—*Reprint from the journal* "ВѢСТНИКЪ САХАРНОЙ ПРОМЫШЛЕННОСТИ" [*Herald of the Sugar Industry*]. *Kiev*, 1913, 11 pp.

This is a report on the studies of parasites of *Euxoa segetum*, Schiff., conducted at the Entomological Station of Kiev for several years. These studies had a twofold object: to rear parasites from specimens of the insects collected in the field and to

infect the latter artificially with its parasites in the laboratory. The following species of parasites have been reared from the hosts at the Station:—ICHNEUMONIDAE: *Amblyteles vadatorius*, Wesm, *A. panzeri*, Wesm., *Ichneumon sarcitorius*, L.; BRACONIDAE: *Macrocentrus collaris*, Spin.; CHALCIDIDAE: *Trichogramma semblidis*, Aur.; BOMBYLIIDAE: *Anthrax flava*, Mg., *A. paniscus*, Rossi; TACHINIDAE: *Peleteria tesselata*, F., *Tachina larvarum*, L., *Cnephalia bucephala*, Mg., *Gonia capitata*, de G.

On the 1st May 1912, 28 pupae and 8 caterpillars of *E. segetum* were collected in a field which was seriously injured by the pests in the previous autumn; these specimens were found at a depth of some 3½ inches and put into an insectarium with the object of obtaining perfect insects. The latter began to emerge from the 22nd May, while on the 25th May the hatching of the parasites, *Amblyteles vadatorius*, started. The parasites were put into a metallic wire cylinder and fed with sugar syrup which was given to them through the wire on the top. The moths were put into an insectarium with earth in which some small plants of convolvulus were growing; between the 28th May and 2nd June the moths oviposited on the leaves and on the 1st and 5th June two lots of caterpillars were obtained, which were bred separately on convolvulus. On 17th June those of the caterpillars which had passed through all the moulting stages were put into a separate glass and kept for one day without food; on the next day they were offered to the parasites and infected by them. The parasites were placed in a bottle with a wide neck tied over with blotting paper, with a hole in the centre; the caterpillars were introduced into the glass by way of this hole, after which the glass was turned upside down; the object of the blotting paper was to absorb the ejections of the caterpillars and to help the parasites to clean themselves from this liquid. Every caterpillar was introduced singly and removed after having been infected; in this way 45 caterpillars were infected during the 18th June. Three caterpillars were immediately preserved in boiling water and spirit, the remainder were kept in the insectarium; 2-3 specimens were taken out every 3 days and preserved. On the 28th July only two pupae remained in the insectarium out of which two specimens of *A. vadatorius* emerged on the 31st July and 2nd August; thus the whole development of the parasites from egg to imago occupied 43-45 days. The second lot of caterpillars were infected by *A. vadatorius* on the 27th June and dealt with in the same way.

A similar experiment on infecting caterpillars of the second generation found on a sugar-beet plantation on the 7th August is also described; most of these infected caterpillars were also preserved; 4 of them were left to winter. Some specimens of *A. vadatorius* after having oviposited on some caterpillars on the 18th October lived in the laboratory till the 2nd November their total life being 85 days. When dissected after their death, their ovaries were found to contain a supply of immature eggs, and the author is of opinion that possibly these parasites, if

kept in a cold room, instead of a warm one, as was the case, would have lived through the winter.

An account is further given of the successful infection in the laboratory of larvae of *E. segetum* by the Braconid, *Macrocentrus collaris*. Up to 50 larvae of this parasite bred in one caterpillar of *E. segetum*, pupating afterwards in a common cocoon; it proved impossible to keep these parasites long, as they perished on the 6th day after they emerged. It was observed that *M. collaris* prefers to deposit its eggs on caterpillars which have just moulted, as the skin is then more tender, and particularly after the 2nd, 3rd and 4th moults. The mode of oviposition by these parasites is described.

Experiments on infecting the eggs of *E. segetum* are also recorded, the parasites being *Trichogramma semblidis*, Aur. On the 27th August some eggs of *Barathra* (*Mamestra*) *brassicae* were found in the field, out of some of which *T. semblidis* emerged on the 30th August. These then infected some eggs of *A. segetum* on the 2nd September, from which a new generation of the parasites emerged after 11 days. This parasite winters naturally in eggs of *Orgyia gonostigma*, *Gastropacha neustria*, *Lasiocampa* and other species.

The author further dwells on the possibility of obtaining a constant supply of *Trichogramma* during the winter months by providing the eggs in which they breed, and describes his own successful method of obtaining eggs of *E. segetum* during the winter. This insect hibernates as a fully grown caterpillar, ready to pupate, and very often it is noticed in the laboratory that the imago appears at the usual room temperature. At the end of December 1912, he obtained from such moths, eggs which were deposited between 8th and 24th January on sprouts of wheat, or directly on the earth in the cages; during the oviposition the moths were fed with sugar-syrup. There were no specimens of *P. semblidis* available and the eggs were left to develop. On the 17th January the first caterpillars appeared and were put into a thermostat at a temperature of 25° C. and fed on leaves of young wheat sprouts. After they had reached their fourth stage they were fed also on tiny slices of potatoes. At the time of writing, 28th February 1913, the caterpillars had completed their development and partly pupated. Thus it has been proved that the wintering caterpillars of *E. segetum* can be made to pupate and emerge, under suitable temperatures, at various times during the winter, and a constant supply of eggs can thus be secured, by the aid of which parasites can be artificially bred and multiplied.

FULMEK (L.). **Neuerungen im Pflanzenschutz (Zoologisher Teil).** [Innovations in plant protection (zoological part).]—Published by the author, Vienna, 1913, 17 pp., 6 figs., 1 pl.

This address to the "Erste österr. Gartenbauwoche," held in December 1912, is confined to general considerations regarding practical plant protection. Reference is made to the recent

growth of scientific institutions for this purpose. A table of pests is given and also one of insecticides with notes on their use. The application of secret preparations is very strongly deprecated.

**Kosten welche die Ausführung des Reblausgesetzes seit 1904 verursacht hat.** [Expenditure entailed since 1904 by the application of the Phylloxera law.]—*Der Weinbau im Grossherzogtum Luxemburg während der Jahre* 1912 *und* 1913, *unter besonderer Berücksichtigung der Reblausfrage, Grevenmacher*, 1913, p. 19.

Following on a former issue (1911) of a memorial pamphlet on vine-growing in the Grand Duchy of Luxemburg, the Distrikts-und Weinbauaufsichtskommissariat in Grevenmacher have published a 1913 edition of this "Denkschrift," on page 19 of which they give a table showing the cost of applying the Phylloxera law since 1904. The contributions of the growers, amounting to $\frac{1}{7}$th of the total for the 10 years 1904-1913, are included. This total amounts to about £10,438. Roughly $\frac{2}{5}$ths of this is for compensation paid; fees, salaries and wages are a little below this; whilst the cost of material was under $\frac{1}{5}$th.

Uvarov (B. P.). БОРЬБА СЪ САРАНЧЕВЫМИ ВЪ СТАВРОПОЛЬСКОЙ ГУБ. ВЪ 1907-1912 Г.Г. [The fight against locusts in the Government of Stavropol, 1907-1912.]—*Stavropol Entomological Bureau, Central Board of Land Administration and Agriculture, Department of Agriculture. St. Petersburg*, 1913, 87 pp., 7 maps, 5 tables.

The yearly invasions of the Government of Stavropol, as well as other parts of North Caucasia, by locusts go back to times immemorial, and the damage done by them is of very great economic importance. The author devotes his work to the history of the appearance of the principal species occurring in the Government—*Stauronotus maroccanus*, Thunb., *Locusta* (*Pachytylus*) *migratoria*, L., and *L. danica*, L.,—since 1907, giving a more or less full account of the extent of the outbreak in each year, the remedies applied, the organisation of the campaign, and its cost, and tracing the breeding places of the pests within the Government, as well as their invasions from the neighbouring Government of Astrachan from the north-east and from the Province of Terek from the south and south-east. Besides these species, there were also found during the last two years: *Caloptenus italicus*, L., *Celes variabilis*, Pall., *Tmethis muricatus*, Pall., *Oedaleus nigrofasciatus*, de G., *Arcyptera flavicosta*, Fisch. All these insects appear less frequently, and in smaller numbers, more or less in company with the principal species and do less, or even no damage. Chief amongst the

pests is *Stauronotus maroccanus*, which has its large and standing breeding-places in the south-eastern parts of the Government, where the hard, unploughed, clayey soil provides suitable spots for oviposition. The flora of these steppes consist of various species of *Artemisia*, *Festuca ovina*, etc. This breeding-place continues over the border into the province of Terek. In years of outbreak the insects spread to the north and north-west; and they prefer to oviposit in steppes lying near to cultivated fields.

The Asiatic locusts (*L. migratoria*) have their breeding-places in the lower valley of the River Kuma, where it is assumed that *L. danica* also breeds, as well as on the lower reaches of the Kalaus; but further investigations are necessary. The Government of Astrachan and the Province of Terek are also a constant source of supply of these pests, as the lower parts of Terek and the coast of the Caspian Sea serve as breeding-places for them. It has been often the case that locusts, coming from these parts have made fruitless all the operations and remedies applied in Stavropol against locally-bred swarms.

Up to 1910 only primitive mechanical remedies were applied in fighting the pests, such as driving them into pits, burning them with straw, crushing by various apparatus, etc.; the cost of these works formed an impost on the population of the neighbouring villages, who were not paid and were sometimes sent to assist in the campaign in distant parts of the country; they were controlled by the police authorities and never gave any definitely favourable results. Since 1910 spraying with insecticides has been used, the fight is carried on by paid workers and directed by entomologists and the results are very satisfactory. As insecticides, Schweinfurt green with lime is mostly used (4 to 5 lb. of green, with double this amount of caustic lime, in about 80 gals. of water); the amount of green varies according to the age of the insects. It has appeared that against *L. migratoria* hand-sprayers are preferable and more convenient, as it is very difficult to move amongst reeds with horse-sprayers; while horse-sprayers are more suitable in steppes or in fields. Against *S. maroccanus* the best results were obtained by Platz sprayers, which however require careful and experienced handling. At the beginning of the campaign the spraying goes on for the whole day, as then the insects in their 2nd and 3rd stages move about only during the hot hours, feeding in the morning and evening; when the groups of insects begin moving spraying is applied only at day-break and late in the evening. The most striking results are obtained if the insects are sprayed when settling down for the night. Besides Schweinfurt green, "Phitonal" was also used (about 10 lb. in about 80 gallons of water) but it killed relatively few larvae; while arsenic (about $2\frac{1}{2}$ lb. in the same amount of water, previously boiled with lime) gave more definite results. In order to make the Schweinfurt green more sticky, so as to withstand the influence of the rainy weather, it has been found preferable to substitute zinc oxide (1 part to 3-4 parts of green) for the lime. The fight against

Asiatic locusts (*L. migratoria*) in 1910 gave no final results and in 1911 they appeared again and affected some 4,200 dessiatins (11,340 acres) in the Government. The operations against them cost more than 38,000 rubles (£4,000) and the pests were practically totally destroyed; in 1912 they appeared only in two limited areas, where they were again destroyed.

Spraying operations against *S. maroccanus* were started only in 1911, when their eggs were deposited over 190 square miles, and the spraying was successful in protecting the greater part of the harvest, at a cost of over £2,840; 14 per cent. of the crop was destroyed by the pests. In 1912 eggs were laid on an area of over 114 square miles, but spraying operations in the eastern part of the Government and a fungus disease (*Empusa grylli*) in the west led to a total destruction of the insects, and no new breeding-places could be discovered. Some farmers this year have used iron shields against the larvae with great success.

The total cost of the campaign against both species in 1912 was £740, an expenditure which was quite justified by the results obtained. However in the autumn of that year there again appeared large swarms of locusts from the Province of Terek and from Astrachan, which caused damage to crops estimated at £526, and they deposited eggs over about 93 square miles.

The author observed some grey flies (unidentified) amongst the locusts (*L. migratoria*) which remained behind on their halting places; these flies did not attack the resting or creeping locusts, but as soon as they started flying the flies immediately dashed after them; the author assumes that the flies oviposit on the flying insects. There were also found other unidentified parasites (*Mermis* sp. and others).

MORITZ & BÖRNER. **Prüfung von Reblausgiften.** [Testing of vine-louse poisons.]—*Mitt. k. Biol. Anst. Land- und Forstwirtschaft, Berlin,* viii, pt. 14, 1913, pp. 44-45.

Experiments were made to test the efficiency of "Saprosol," a patent preparation containing about 60 per cent. Kresol, in killing *Phylloxera*, and its effect upon the vines themselves. It was found that a 1 per cent. solution in water killed the *Phylloxera* at a temperature of 12°-15° C. in 10-15 minutes: 2 per cent. and 3 per cent. solutions were efficient in 5 minutes. Eggs were destroyed at a temperature of 18°-20° C. in a 3 per cent. solution in 20 minutes, in 4 per cent. and 5 per cent. solutions in 10 minutes. In 1912, 30,000 vines were experimented upon, consisting of 6,000 of each of five varieties. Each of these groups was divided into 24 bundles, each of 250 plants, half were treated with Saprosol, and the other half with water (other conditions being the same) for 10, 20 and 30 minutes respectively. Those treated with Saprosol were washed afterwards with water. The treated plants were then planted 1.

8, 15 and 22 days afterwards. Those planted at first had unfavourable weather (snow) to face; the third set planted had very favourable weather; but on the whole, when allowance has been made for this, it was found that by the autumn, in 62 rows, the Saprosol-treated plants were healthier than those treated with water only, while in 58 rows the reverse was the case. Between the plants treated for 10, 20 and 30 minutes there was no distinct difference to be noticed. A final statement of the results cannot be made before the autumn of 1913.

In these experiments the contents of the Saprosol used was in the following proportions: Kresol 60-65 per cent., alkalis 5-6·6 per cent., pure alkali ·24-1·4 per cent. (both reckoned as KOH), water 7-10 per cent.

ZACHER. **Versuche mit Kornkäfern.** [Experiments with the corn-weevil.]—*Mitt. k. Biol. Anst. Land- und Forstwirtschaft, Berlin*, viii, pt. 14, 1913, p. 43.

Experiments were made to find out the behaviour of the corn-weevil (*Calandra granariae*, L.) towards acorns, especially those which are shelled and ground up for food for animals. In October 1911, 100 weevils were put in each of two glasses, one containing shelled, the other unshelled acorns. In the following June it was found that only those weevils had reproduced which had been given the shelled acorns; of the others 99 were dead. The weevils that had reproduced gave rise to 198 living and 48 dead imagines up to the time of counting. It seems therefore that even in the case of the shelled acorns, these are not so favourable for the weevils to breed in, as grain; for from 100 weevils fed on acorns 246 imagines were bred, while from the same number fed on grain 1,176 imagines were obtained in the same time.

ZACHER. **Koloniale Schädlinge.** [Colonial pests.]—*Mitt. k. Biol. Anst. Land- und Forstwirtschaft, Berlin*, viii, pt. 14, 1913, pp. 41-43, 2 figs.

Specimens of diseased cotton plants were sent from Togo. An accompanying description of the disease stated that for the first 3½ months the plants had grown well, then a blackening of the twigs and green shoots had set in, and the roots became thickened. No specific cause of the damage had been found, but there was no doubt that it was caused by an insect; sections of the thickened roots showed that they had been bored as if by a Longicorn or weevil. Similar damage to cotton plants has been observed in German East Africa and was attributed to *Apion xanthostylum*, Wagn.

The plants were also suffering from other symptoms, very suggestive of the disease caused by the Buprestid beetles,

*Sphenoptera neglecta*, Klg., one of the most dreaded pests of cotton. The borings of this insect are in the upper parts of the stems, and are spirally twisted.

MAASSEN & BEHN. **Uber ein neues Mittel gegen die Faulbrut.** [A new remedy for Foul-brood.]—*Mitt. k. Biol. Anst. Land- und Forstwirtschaft, Berlin*, viii. pt. 14. 1913, pp. 47-48.

A new method of curing and preventing foul-brood has been recently recommended in papers upon bee-keeping. This remedy, called "Imkerat" is a cloudy, yellowish-brown liquid of a syrupy consistency. Its efficiency in cases of foul-brood has been tested, and the experiments showed that it cannot be regarded as a remedy for this disease; the epidemic persisted in spite of treatment, and treatment did not prevent the spread of the disease to healthy hives.

BUSCK (A.). **Two Microlepidoptera injurious to Chestnut.**—*Proc. Entom. Soc., Washington*, xv. no. 3, Sept. 1913, pp. 102-103, 1 fig.

Two new species of Microlepidoptera are described, both of which were taken from the chestnut tree, which they are said to damage, though in what respect is not stated. The first, *Sesia castaneae*, breeds in the trunk of the tree; it resembles *S. pictipes* somewhat closely, but differs in the markings on the wings and body. It was found at Lynchburg, Virginia, and at Snow Shoe, Pennsylvania. The second, *Ectoedemia castaneae*, was bred from small galls on young twigs of the chestnut, recalling in form and size the egg-masses of the forest caterpillar. It was taken at Vietch, Virginia.

SASSCER (E. R.) & PIERCE (W. D.). **Preliminary Report on the finding of a new Weevil Enemy of the Potato Tuber.**—*Proc. Entom. Soc., Washington*, xv. no. 3, Sept. 1913, pp. 143-144, 2 pls.

In May of this year a number of potato tubers (*Solanum tuberosum*) were received from the neighbourhood of Huarochiri, Peru, and upon examination were found to be mined by a weevil and also by the potato-tuber moth (*Phthorimaea operculella*, Z.). Material infested with larvae, pupae and adults of the weevil was received from the following localities during May:—Cuzco, Temuco, and Arequipa, Peru; Oruro, Bolivia; and Ancud or San Carlos and Castro Islands, Chile. In many cases injury occasioned by these weevils was quite noticeable. A few of the tubers, superficially sound, on being opened were found to be infested. Two adults were kept alive from 24th May to 6th September, during which time they fed but little, and then only on potato foliage. The insect was determined by one of the authors

as *Rhigopsidius tecumanus*, Heller, a species originally described from Tecuman, Argentine. It belongs to the subfamily Rhytirrhininae.

Walton (W. R.). **Efficiency of a Tachinid Parasite on the last Instar of** ***Laphygma*****.**—*Proc. Entom. Soc., Washington*, xv, no. 3, Sept. 1913, pp. 128-131, 1 table.

Taking advantage of an abundance of *Laphygma frugiperda* occurring in the grounds of the Department of Agriculture at Washington, experiments were made regarding the efficiency of Tachinid parasites upon the last instar of the caterpillar. As this instar is of longer duration than the previous ones, it seems that the caterpillar is then more open to attack by the parasite than in the first instar in which the eggs are often thrown off at the moult.

Twelve caterpillars of *L. frugiperda*, all bearing parasitic eggs, were kept under similar conditions and watched. Regarding (1) the effectiveness of parasitism, this is very high for this species of parasite, as in all cases the host was killed; (2) as regards the maximum number of adult Tachinids to issue from a single host, it was found that in one instance the number was 3, in five cases 2, and the rest bore but a single parasite; (3) the effect of supernumerary eggs varied inversely with the degree of development of the resulting adults, that is to say, where the caterpillar bore many eggs, the adult parasite was smaller than when only one or a few eggs were borne by the host; (4) the species of Tachinid reared was *Winthemia quadripustulata*, F.

Subsequent to making these experiments the author saw Dr. Nielson's paper upon *Tachina larvarum*, L., and its parasitism on *Zygaena filipendulae*. The two sets of experiments agreed in essentials; Dr. Nielson however adds that in cases where several flies emerged from the same host, their size was not equally reduced, one or two of them not differing in size from that of flies which had developed solitary, the remainder being undersized.

In discussing the paper Mr. Pierce stated that in the south he had found *Chelonus texanus*, Cresson, which laid its egg in the egg of *Laphygma*, to be a much more efficient parasite than the Tachinid mentioned by the author; he said that *Chelonus* caused a total mortality and emerged from the third or fourth instar of the *Laphygma* larvae.

**How to make Bordeaux Mixture adhesive.**—*Agric. Gaz., N.S. Wales, Sydney*, xxiv, pt. 10, Oct. 1913, p. 868.

The following are the principal conclusions of experiments made at the Viticultural Station of Villefranche-sur-Saône on the processes adopted for the purpose of giving adhesive properties to spraying mixtures used for vines. The addition of

gelatine gives solutions great superficial vicosity, and it is advised that it be added to copper mixtures to make them adhesive. Gelatine, 3 oz. to 8 oz. per 100 gals., can be used for Paris green and for acid Bordeaux mixture and Burgundy mixtures; alkaline substances present in a mixture renders the gelatine insoluble, thereby diminishing its viscosity. Among substances costing little, which can take the place of gelatine, casein gave the best results. A very adhesive spray is made by adding 3 oz. to 8 oz. of casein dissolved in a small quantity of milk of lime to Bordeaux mixture prepared in the ordinary way. In an acid medium, casein is insoluble and therefore useless. Milk of lime may be made by mixing slacked lime with water sufficient to make a milky liquid. It is suggested that the casein be dissolved by the following process: mix intimately 3½ oz. of powdered well-burnt lime with 1½ oz. of powdered casein. Add to the mixture very little water and work it well into a paste. Thin it down with successive small quantities of water till about a quart of liquid is obtained, which is then to be added to the Bordeaux mixture.

**Trial of "Safonia" Spray at Yanco.**—*Agric. Gaz., N.S. Wales, Sydney*, xxiv, pt. 10, Oct. 1913, p. 886.

A sample of "Safonia" spray was received from the manufacturers and forwarded to the Yanko Experiment Farm for trial as a destroyer of aphis, caterpillars, etc. Two applications were made with a bucket spray pump on 5th and 18th June 1913, on a row of mixed cabbages and a row of Early London cauliflowers. The rows were about 40 yards long, and at the first application 3 gals. of the mixture were used at the rate of a pint of "Safonia" to 4 gals. of water, and at the second application 6 gals. were used. The plants were thoroughly sprayed, top and bottom, and as a result all the aphids were killed, even though some of the plants were badly infested.

Zacher (F.). **Literaturbericht über Schädlinge von Kakao, Kaffee und Tee (1906-12).** [Literature on pests of cacao, coffee and tea plants.]—*Zeits. für Wissen. Insektenbiol., Berlin*, ix, pt. 10, 15th Oct. 1913, pp. 317-320.

This paper gives the literature of pests of cacao, coffee and tea, with a brief summary of the contents of each work mentioned.

Werner (F.). **Massenansammlung von *Coccinella*.** [Swarming of *Coccinella*.]—*Zeits. fur Wissen. Insektenbiol., Berlin*, ix, pt. 10, 15th Oct. 1913, p. 311.

In reading the account of Carnes of the hibernation in mountains of the Coccinellid *Hippodamia convergens*, which has proved a very useful enemy of the leaf-louse in Californian

melon plantations, the author brings to mind certain observations which he made in August 1901, while climbing the Bithynic Olympus, near Brusa in Asia Minor. In protected spots on the mountain peak there were many thousands of ladybirds (*Coccinella septempunctata*), crowded together in a lethargic condition, doubtless owing to the low temperature and the neighbouring snowfields. Whether these ladybirds were already collected together to hibernate or what other cause brought them there in such numbers is not known.

KURDJUMOV (N. V.). **Notes on *Tetrastichini* (Hymenoptera, Chalcidoidea).**—*Revue Russe d'Entomologie, St. Petersburg*, xiii, no. 2, 20th Oct. 1913, pp. 243-256, 8 figs.

The following notes are partly a result of the author's own studies of some Russian representatives of this group of insects, and partly of his acquaintance with the collections of Forster, Mayr, Ratzeburg and Ashmead. In the tables accompanying the notes 9 genera are described, of which 6 are found in Europe, while three, possessing two-jointed funicles, have thus far been observed only in America and in the Hawaiian Islands. The following genera have not been included in the tables: *Tetrastichodes*, Ashmead, *Trichoporus*, Förster, *Gyrolasia*, Förster, *Syntomosphyrum*, Förster, *Ceranisus*, Walker, and *Baryscapus*, Förster. The author is of opinion that the genus *Tetrastichodes*, notwithstanding the absence of a line on the mesonotum, is synonymous with *Geniocerus*, Rtzb.; that the genus *Trichoporus* is synonymous with *Astichus*; that *Gyrolasia* is a synonym of *Pteroptrix*, Westw.; that the genus *Syntomosphyrum* cannot be upheld, the various species included in this genus belonging either to *Tetrastichus* or *Geniocerus*, while the species, *S. indicum*, being a parasite of *Ceratitis capitata* (Prof. Silvestri), ought to take its place as a sub-genus in the genus *Mellitobia*; *Ceranisus* and *Baryscapus* differ from the other genera by the strongly thickened scape of the antennae, a character which, in the opinion of the author, is found only in the males. Some species of *Tetrastichus*, as well as of *Geniocerus*, have also a swollen scape. The genus *Tetrastichus*, Hal., is, according to the author, not synonymous with *Geniocerus*, Rtzb.; the typical species of *Tetrastichus* (*Eulophus miser*, Nees) has only one bristle on the submarginal vein, while the typical species of *Geniocerus* (*G. erythrophthalmus* = *Eulophus roesselae*, de Geer) has several bristles.

KURDJUMOV (N. V.). **Notes on European species of the genus *Aphelinus*, Dalm. (Chalcidoidea), parasitic upon Plant Lice.**—*Revue Russe d'Entomologie, St. Petersburg*, xiii, no. 2, 20th Oct. 1913, pp. 266-270.

The species of this genus, which are very numerous, are primary parasites of APHIDIDAE, the females ovipositing in the

very young hosts. The egg is long and bent in the middle, resembling the eggs of other Chalcidoidea. The larva is practically globular, with a small head and a short tail appendix. About one week after the egg has been deposited the aphis dies, turning a dark blue colour. The whole cycle of development of the parasite lasts 18-22 days, from the middle of July to the middle of August; later in the season, when the temperature is lower, the time of development is longer and in the hibernating stages it lasts several months. The parasite hibernates in the pupal stage, principally inside the sexual forms of the host, as the author has satisfied himself in a case of *Aphelinus subflavescens*, Westw. These parasites appear to attack Aphids less frequently than do BRACONIDAE.

The author gives a synoptic table of the European species with hairy eyes, including some species named by A. Förster, but not described by him, viz., *flaviventris, dubia, brachyptera* and *daucicola*.

JATZENKOVSKIJ (E. V.). НѢСКОЛЬКО МЫСЛЕЙ ОБЪ ЭНТОМОЛОГИЧЕСКИХЪ СТАНЦІЯХЪ. [On the functions of Entomological Stations.]—*Revue Russe d'Entomologie, St. Petersburg*, xiii, no. 2, 20th Oct. 1913, pp. 336-341.

The author points out that, owing to the peculiar conditions obtaining in Russia, the purely advisory work of entomologists, based on foreign experiments and scientific study, cannot prove of much practical value; for besides this scientific knowledge, the entomologist ought also to know which remedies are the best in a given case, and how far they are economically possible for the local population. Thus the entomological stations must provide for two lines of action—practical field work and purely scientific investigation. Just as the eradication of locusts has been made a national question, the fight against other pests must also take the same course.

The author puts forward the following rough outline of the functions of practical organisations of this kind:—(1) Exact registration and study of local peculiarities in the biology of various pests; (2) in cases in which the spread of the pests assumes the character of a national calamity, the stations must provide the necessary remedies, by means of special funds which must always be under the control of the Director of the institution; (3) they must acquaint the population with the biology of various pests and remedies against them; (4) they must conduct experimental remedial measures, in order to educate the population, which will thereafter be able to apply its own remedies in case it is impossible to organise a national campaign; (5) they must reply to the various inquiries with regard to injurious insects in the district.

These stations must also have experimental departments, or a special experimental station must be provided, where the pests must be studied under natural and artificial conditions, as well as their parasites, etc. The activity of such stations cannot be properly controlled by a central authority, but conferences, congresses, etc., can to some extent supply the necessary co-ordination.

JATZENKOVSKIJ (E. V.). НѢКОТОРЫЯ ДАННЫЯ КЪ БІОЛОГІИ САРАНЧИ. [Some data on the biology of locusts (*Locusta migratoria*, L.).]—*Revue Russe d'Entomologie, St. Petersburg*, xiii, no. 2, 20th Oct. 1913, pp. 323–335, 11 figs.

An account of the pairing habits and oviposition of these locusts, as observed in the Government of Stavropol. The author states that the shape of the egg-masses varies in accordance with the soil in which they are deposited.

JATZENKOVSKIJ (E. V.). НѢКОТОРЫЯ ДАННЫЯ ПО ИСТРЕБЛЕНІЮ МАРОККСКОЙ КОБЫЛКИ ВЪ СТАВРОПОЛЬСКОЙ ГУБ. [Some details of the destruction of *Stauronotus maroccanus* in the Government of Stavropol.]—*Revue Russe d'Entomologie, St. Petersburg*, no. 2, 20th Oct. 1913, pp. 342–359, 3 figs.

The author spent the spring and part of the summer of 1912 in the Government of Stavropol, where he was controlling the operations against *S. maroccanus*, and this is practically a report of the campaign, being more detailed than that by Uvarov. The hatching of the pests took place principally from the 3rd to 5th and 16th to 18th May and in a smaller degree from the 8th to 10th and 21st to 23rd May. After hatching, the insects lay for some time motionless near the egg-clusters and very soon started to collect in large companies ("kuligi"). During the first two moulting periods the pests moved towards the east or south-east; after this their movements were less regular and the exact direction could not be ascertained. The "kuligi" move with a gradually increasing speed, the latter reaching occasionally as much as 1,400 yards a day. The locusts began flying in the first half of June.

The author considers the chemical remedies—spraying with insecticides—as being the most effective and affording a reliable protection against the pests. The mechanical remedies, as applied previously, proved very unsatisfactory and had to be forbidden, as, owing to the dispersion of the "kuligi," they interfered with the efficiency of the spraying; this applies specially to burning with straw.

**Paillot (A.). Coccobacilles parasites d'Insectes.**—*C.R. de l'Acad. des Sciences, Paris*, clvii, no. 15, Oct. 1913, pp. 608-611.

Entomophytic bacteria, and in particular, their usefulness in combating harmful insects, have been the subject of much recent work. The present author succeeded, in May last, in discovering a bacillus in caterpillars of *Gortyna ochracea* (a pest of the artichoke) causing an epidemic disease among them. At first the diseased caterpillars were little different from the healthy ones, but later they lost the use of their legs, all except the first pair, and the posterior part of the body seemed to have lost all sensation; after death the body quickly decomposes. Microscopic examination showed the presence in the blood of a great many mobile coccobacilli, often paired in twos, some in the coccus form and others rod-shaped. In the case of *Gortyna*, death is brought about by septicaemia.

In the tissues of apparently healthy caterpillars of this species, bacilli have been observed; it is possible that certain of them are immune from the disease, which would account for the fact that in some cases, in which injections of the bacillus have been made, disease did not always result, whereas when the same injections were made upon caterpillars of another species, *Lymantria dispar*, for example, disease invariably resulted. According to recent researches, it would seem that such bacterial parasites are not uncommon in insects; on examining the tissues and blood of caterpillars of *Pyrameis cardui*, the author isolated two different coccobacilli. Following the custom of previous authors, he has separated the coccobacilli of *Gortyna* and *Pyrameis* from others under the names of *Bacillus gortynae*, *B. pyrameis I.*, and *B. pyrameis II.*

**Bentley (G. M.). Suggestions on preparation and use of spray formulas.**—*Bulletin of the Agricultural Experiment Station of the University of Tennessee, Knoxville*, no. 99, April 1913, pp. 63-82, 8 figs.

Besides a very full list of formulae the author gives practical suggestions on their preparation and use and the illustrations given are of a useful character. A simple, cheap and effective emulsifier is figured and described, for use with kerosene and soap mixtures. It consists essentially of a tin cylinder with a cover and a hollow conical plunger with holes in it; the cylinder is 18″ long and 4″ in diameter; the plunger is a ½″ iron rod fitted at the end with a tin cone 3½″ high and fitting the cylinder easily; ½″ from the base of the cone 5 holes, each ¼″ in diameter, are made at regular intervals and about 1″ from the end of the cylinder are 7 holes of the same size. It is claimed that the use of this simple device produces a perfect emulsion. Prof. H. A. Morgan of the Louisiana Experiment Station, Baton Rouge, is the inventor.

# LIST OF PUBLICATIONS EXAMINED.

## EUROPE.

### Austria-Hungary.

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Jahres u. Sitzungsberichte der K. Böhmischen Gesellschaft der Wissenschaften (Prag).
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Acta et Meddelanden Societatis pro Fauna et Flora Fennica (Helsingfors).
Acta Societatis Scientiarum Fennicae (Helsingfors).

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Bulletin de la Société Zoologique de France (Paris).
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Le Moniteur d'Horticulture (Paris).
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Nouveautés Viticoles (Villefranche).
Nouvelles Archives du Muséum d'Histoire Naturelle (Paris).
Le Progrès Agricole et Viticole (Montpellier).
La Quinzaine Coloniale (Paris).
Recueil de Médecine Vétérinaire (Alfort).
Revue générale de Botanique (Paris).
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La Revue de Phytopathologie Appliquée (Paris).
Revue Scientifique (Paris).
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Revue de Viticulture (Paris).
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**Germany.**

Abhandlungen herausgegeben vom naturwissenschaftlichen Verein zu Bremen.
Abhandlungen K. Bayerische Akad. der Wissenschaften (Munich).
Abhandlungen K. Gesellschaft der Wissenschaften zu Göttingen (Berlin).
Abhandlungen Königliche Preussische Akademie der Wissenschaften (Berlin).
Abhandlungen K. Sächsische Gesellschaft (Leipzig).
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Archiv für mikroskopische Anatomie und Entwickelungsgeschichte (Bonn).
Archiv für Naturgeschichte (Berlin).
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Berichte der Bayerischen Bot. Gesellschaft (Munich).
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**Germany**—*cont.*

Bericht der Oberhessischen Gesellschaft für Natur-und Heilkunde (Giessen).
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Mathematische und naturwissenschaftliche Berichte aus Ungarn (Berlin).
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Atti della R. Accademia della Scienze di Torino (Turin).
Atti del Reale Istituto Veneto di Scienze Lettere ed Arti (Venice).
Atti della Società italiana di Scienze naturali, e del museo civico di Storia naturale (Milan).
Atti della Società Ligustica di Scienze naturali e geografiche (Genoa).
Atti della Società per gli Studi della Malaria (Rome).
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Bollettino del R. Orto Botanico di Palermo (Palermo).
Bollettino della R. Stazione Sperimentale di Agrumicoltura e Frutticoltura (Acireale).
Bollettino delle Sedute della Accademia Gioenia di Scienze Naturali in Catania.
Bollettino della Società Entomologica Italiana (Florence).
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Aarsberetning fȯr Stavanger Museum (Stavanger).
Archiv fȯr Mathematik og Naturvidenskab (Christiania).
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California University Agricultural College: Publications (Berkeley).
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Maryland Agricultural College: Publications (College Park).
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# INDEX OF AUTHORS.

A Reference in heavy type indicates that a paper by the author has been abstracted.

* Bull. No. 165 of the New York State Museum is erroneously attributed to J. M. Clarke in the text; the real author is E. P. Felt.
† The article is erroneously attributed in the text to G. W. Herrick.

# GENERAL INDEX.

In the case of scientific names the page reference is cited only under the heading of the generic name.

When a generic name is printed in brackets it signifies that the name is not adopted.